



VOL. III.

**DISLOCATIONS
TO
INFANTILE
MYXOEDEMA**



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ANALYTICAL CYCLOPÆDIA
OF
PRACTICAL MEDICINE

BY
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AND
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VOLUME III



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PREFACE TO THE THIRD VOLUME.

IN presenting the third volume to the profession the editor wishes to state that the kind reception accorded the first two has been the source of much gratification. It has shown that the plan of the work has met the wants of the general practitioner while preserving for authors and teachers the leading advantages of the older annual. This is, of course, greatly due to the continued assistance of the members of the Associate Staff, who invariably have given the work the benefit of their best efforts.

The plan of giving special space to subjects calculated to elucidate, by the close analysis involved, many obscure phases of pathogenesis, has been continued in this volume. The articles on "Infantile Myxœdema (Cretinism)," by Professor Osler and Dr. Norton, of Baltimore; "Exophthalmic Goitre," by Professor Putnam, of Boston; and "Goitre," by Professor Adami, of Montreal, thus form a trio which may be said to point to much of the progress that is to attend medicine in the near future. This, of course, has not in any way diminished the practical value of the work, for the third volume seems especially favored in this direction. The articles on "Dysentery," by Dr. Flexner, of Baltimore; on "Endometritis," by Professor Byford, of Chicago; on "Dislocations" and "Fractures," by Professor Stimson and Dr. Keyes, Jr., of New York; on "Gout," by Dr. Levison, of Copenhagen; on "Hip-joint Disease," by Dr. Reginald H. Sayre, of New York; "Eczema," by Professor Stelwagon, of Philadelphia, are all models of their kind, and may be mentioned as particularly valuable to the general practitioner. An analytical study of "Hysteria" and "Hypnotism," by Professor Eskridge, of Denver, also forms an especially attractive feature of this volume, which it is hoped will meet with the approval of its readers.

THE EDITOR.

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SAJOUS'S ANNUAL

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DISLOCATIONS.

Definition.—A dislocation is a permanent, abnormal, total, or partial displacement from each other of the articular portions of the bones entering into the formation of a joint.

A sprain is a temporary, partial displacement, reduced immediately and spontaneously.

In total, or complete, dislocations the articular surfaces are completely separated, or touch each other only at their edges. In ball-and-socket joints the dislocation is said to be complete when the centre of the globular head is displaced beyond the rim of the concave socket.

Lesser forms of displacement are termed partial, or incomplete, luxations, or subluxations.

A diastasis is a subluxation in which the separation occurs in a plane perpendicular to that of the articular surfaces, without lateral gliding of one upon the other. The most frequent examples of this condition are the so-called "subluxation" of the head of the radius in children, and the tibio-fibular diastasis in Pott's fracture.

A dislocation is complicated by injuries to surrounding tissues of sufficient importance to affect materially the symp-

toms, prognosis, diagnosis, or treatment. It is rendered compound if the laceration of the soft parts establishes a communication between the cavity of the joint and the outside air.

Symmetrical dislocations on both sides of the body (viz., both shoulders, both hips) are termed double. If they occur in the one bone (jaw, vertebræ), they are called bilateral.

Varieties.—Dislocations are classified, according to their etiology, as traumatic and spontaneous. *Traumatic* dislocations are caused, not only by external violence, but also by muscular force. Such, for example, as the forward dislocation of the mandible. *Spontaneous* dislocations are due to pathological processes in or about the joint which so weaken its normal supporting structure that luxation occurs gradually (or suddenly) and without recognizable trauma. Occurring in extra-uterine life these dislocations are termed *pathological*, while, if their origin is prenatal, they are *congenital*.

Nomenclature.—Usually the distal member of a joint is said to be dislocated,—the most notable exception is the so-called dislocation of the outer end of the clavicle (acromio-clavicular joint); and the direction of the dislocation is that taken by the dislocated bone: thus

a backward dislocation of the humerus means that the head of the humerus has been dislocated backward from the glenoid cavity, and lies behind it (unless it has been shifted by a secondary or consecutive displacement). Sometimes, however, we speak of a dislocation as of the joint itself, dislocation of the elbow, of the knee; here, again, the direction of the dislocation being that taken by the distal segment. Thus, instead of saying a "backward dislocation of the humerus," we might say "a backward dislocation of the shoulder." Subvarieties are named, according to the new anatomical position of the distal segment, as subcoracoid,



Fig. 1.—Diagram to show the action of a ligament in limiting the range of motion in a dislocation. (*Stimson, "Dislocations."*)

dislocation of the humerus, iliac (or dorsal) dislocation of the thigh.

Finally, it is well to bear in mind the distinction between "typical" and "atypical" dislocations, typical dislocations being those in which the attitude of the limb is characteristic, and atypical those in which, owing to the laceration of some opposing structure, whose integrity is usually preserved, the characteristic position is not present. An "atypical" backward dislocation of the hips is the so-called "everted dorsal," in which, owing to the rupture of the outer branch of the Y-ligament, the thigh is everted instead of assuming the usual attitude of inversion and adduction.

Symptoms.—Deformity is always pres-

ent. The displacement of the articular surface changes the normal contour: a change which can be accurately verified by ascertaining by palpation the abnormal position of the various bony prominences; moreover, the new position of the head of the bone makes a new and abnormal centre for the movements of the joint, and, in connection with the restricting influence of untorn ligaments or bony prominences, gives rise to a more or less characteristic attitude and restriction of motion in certain directions.

The comprehension of the causes which produce this constrained attitude and restricted motion, while of great assistance in diagnosis, is, in many cases, absolutely essential to intelligent manipulative treatment, for those same forces that aid our diagnosis we must take into account in our efforts to effect reduction. These forces are purely mechanical. The dislocated bone plays the part of a lever whose long arm extends from the attachment of certain ligaments to its distal extremity and whose short arm is that part of the bone between this point of attachment and the head of the bone.

The figure shows how the ligaments opposite the side toward which the bone has been displaced are put on the stretch by attempts to move the lower part of the limb in the same direction, so long as the head of the bone impinges upon the outer edge of the articular surface or some similar obstacle. Hence the abnormal attitude and restriction of motion in some directions—and possibly abnormal mobility in others, be it noted—and hence, also, the inference that such an obstacle is not to be overcome by brute force, but rather by strategy and dexterity.

Shortening or lessening of a limb is another aspect of the deformity. As a sign, however, it is most unreliable. Fig.

2 indicates the relative positions of the bones in a subcoracoid dislocation of the shoulder as compared with the normal joint. With the arm abducted, the shortening is marked, but in adduction there is little or no shortening; indeed, there may be some lengthening.

Crepitation of a fibrous quality may be elicited during manipulation by friction of the bone over fibrous or cartilaginous structures, and means nothing. True bony crepitus means, of course, a fracture.

Pain is always present, and is due to two causes. There is the primary pain caused by the laceration of the tissues at the moment of the dislocation. This soon passes away. Any persistent pain is due to pressure on nerves, and can only be relieved by the removal of that pressure.

Loss of Function.—This is usually complete, and due partly to the pain and partly to the fixation caused by the changed relations of the bones.

Symptoms of Old Unreduced Dislocations.—Deformity of contour and attitude, as well as restriction of motion, will persist as long as the dislocation remains unreduced; but, as the parts tend to adapt themselves to their altered conditions, the disability becomes progressively less, as a general rule, until the functions of the limb can be fairly well performed. But several conditions may interfere with this restoration of function. An excessive production of callus may limit the motions of the joint, or even ankylose it in an awkward position; the head of the bone may be progressively displaced farther from its normal situation, and the disability thus become greater instead of less; or an intractable neuralgia or œdema may result from pressure on adjoining nerves or vessels.

Diagnosis.—The one demonstrative

sign of dislocation is the recognized presence of the head of the dislocated bone in an abnormal position. One may make the same inference from the negative evidence; namely, the absence of the head of the bone from its normal situation. Thus, in backward dislocation of the ribs or the sternum the diagnosis is made by the absence of the heads of the bones from where they should be, and not by their presence where they should not be.

In such localities as the fingers or knee the head of the bone may be seen; elsewhere it may be felt, as in the jaw (forward) or the shoulder; or, again, the diagnosis may only be ascertained by

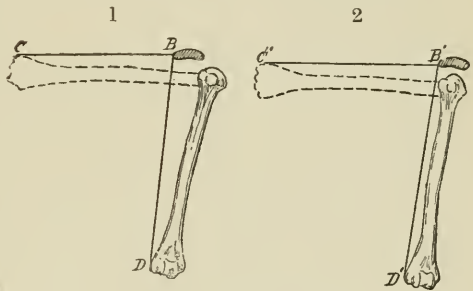


Fig. 2.—Diagram to show the effect of attitude upon the measured length of the arm (1) in dislocation of the right shoulder and (2) when the bones are in a normal position; B, B', the acromion. (*American Text-book of Surgery.*)

finding an indefinite mass which partakes of the motions imparted to the bone. Measurements may help; but, as above noted, are liable to be fallacious.

In typical dislocations the attitude of the limb and the limitation of motion are usually the first hint the surgeon obtains of the nature of the case; but, we repeat, the only conclusive evidence is the discovery of the head of the bone out of its normal place.

DIFFERENTIAL DIAGNOSIS.—The differentiation of a simple dislocation from a fracture at or near the articular surfaces

is often difficult, sometimes impossible. If the fracture is through the neck of the bone (without impaction) the dislocated head will not move with motions imparted to the shaft of the bone; but will, on the contrary, give rise to a bony crepitus, unless some soft parts are interposed. But if the fracture consists simply of the splintering of an articular edge, or the tearing off of a tuberosity, the fragment may be pushed or drawn away and give no evidence, except perhaps a weakness in the joint, a lack of certain motions, or a tendency to recurrence of the dislocation, for which we can only assign the fracture as a probable cause.

The statement that mobility is increased in fracture and decreased in dislocations is misleading and inaccurate. In fractures mobility is not increased, but created where before it was not. In dislocations it is decreased in some directions, but it is not infrequently increased in others; and, indeed, with sufficient laceration of all the soft parts it may be increased in all directions. A dislocation may be readily differentiated from a contusion or sprain by examination under ether.

Etiology. — PREDISPOSING CAUSES.—

Normal predisposing causes exist to a greater or less degree in all joints; otherwise no joint not diseased could be dislocated: a theory long since rejected. These causes mainly exist in the conformation of the bony surfaces which make up or surround the joint. In some positions there is little resistance to a dislocating force properly applied. Thus, the wide-open jaw may be dislocated forward by a relatively-small force, there being but the slightest resistance of bone and ligament to overcome. Or, again, the normal angle at the joint, as at the elbow, predisposes to dislocation by ap-

plying a transmitted force (from the hand) in a direction oblique (upward and inward) to the long axis of the joint, and thus tends to force the articular surfaces over each other in an abnormal direction. Moreover, certain outlying prominences may aid dislocation by acting as fulera to pry out the head of the bone, as does the olecranon in hyperextension of the elbow and the acromion in hyperextension of the shoulder. Some joints are also more frequently exposed to external violence than others. Pathological predisposing causes are fracture or disease of the bones, disease of the ligaments or atrophy of muscles that act as ligaments, and distension of the joint with fluid.

IMMEDIATE OR DETERMINING CAUSES.

—External violence may cause dislocation directly by acting upon the articulation itself, as a dislocation of the humerus by a blow upon the shoulder, or indirectly by force transmitted through the shaft of the bone, as in the same dislocation caused by a fall upon the outstretched hand, or more complexly by leverage, as when a fall upon the shoulder dislocated the inner end of the clavicle upward by leverage exerted on the first rib as a fulcrum.

Muscular action may also be exerted either directly or indirectly. Thus, yawning is a common cause for dislocation of the lower jaw. In fact, certain persons can voluntarily dislocate one or other of their joints. The most common example is the backward subluxation of the first phalanx of the thumb; but there are also a few subjects who can throw out their larger joints, as, for example, a man who is at present traveling about exhibiting his power of dislocating both hips and both shoulders.

Pathology of Recent Dislocations.—

In joints relaxed by paralysis or effusion

(and in the jaw) dislocation habitually takes place without laceration of the capsule. In all other cases (excepting the voluntary dislocations before mentioned) the capsule is torn. In enarthrodial joints the rent is on the side toward which the round head of the distal bone is displaced. In other joints any or all of the ligaments may be torn. The firmer bands, instead of giving way themselves, may strip up the periosteum or tear away the bony prominences to which they are attached. Opposing muscles put upon the stretch may act in the same way. The bones may also be broken by impact on each other; thus fracture of the olecranon occurs in anterior dislocation of the elbow, and a mutual bruising of the head of the humerus and shattering of the rim of the glenoid cavity in dislocations of the shoulder.

Complications. — Fractures worthy of the name of complications may occur. Some, indeed, such as fracture of the anatomical neck of the humerus, may prove insurmountable obstacles to reduction. External wounds, especially if they compound the dislocation, may prove serious complications. Adjoining vessels may be ruptured and give rise to fatal hæmorrhage or to occlusion and gangrene, or to traumatic aneurisms. The rupture of nerves, of which the most common is circumflex at the shoulder, may cause permanent paralysis and anæsthesia. The viscera are rarely injured unless by some other associated trauma.

In old unreduced dislocations the lacerated connective tissue about the head of the bone becomes thickened and forms a pseudocapsule, while the periosteum on which the head of the bone now rests is stimulated and throws out a ridge of bone so as to form a new articular cavity, sometimes lined with fibrocartilage. The muscles and ligaments shrink or elongate

to adapt themselves to their changed circumstances, and thus a comparatively useful new joint may be formed. In the meanwhile an opposite train of events takes place in the old joint-cavity. It is obliterated either by adhesion of the capsule or by filling up with granulation-tissue. Thus not only is the dislocated bone fixed in its new position, but also the old socket is obliterated and rendered unfit for its reception. It is important to note that the scar may include neighboring vessels or nerves and by pressing on them give rise to neuralgia or œdema without any direct pressure by the bone itself, and, moreover, the tearing of this tissue in attempts at reduction may result in fatal injuries to vessel or nerve.

Prognosis.—Reduction is usually followed by repair of the damage done, and within a few weeks the joint is as useful as ever. Occasionally, however, a permanent laxity of the capsule remains, which allows the dislocation to recur on more or less slight provocation, and with each recurrence the tendency grows more marked. Occasionally, also, without any unusual evidence of injury to the nerves at the time of occurrence of the accident, a dislocation may be the starting-point of an intractable neuralgia, or it may predispose the joint to rheumatism. The complications above mentioned render the prognosis more grave.

In old unreduced dislocations the prognosis is different for every individual case. In some the new joint will become fairly useful, in others not so; yet the prospect of relief by operation is none of the brightest.

Treatment. — A recent dislocation should be immediately reduced unless great inflammatory reaction, swelling, or shock render the infliction of pain or the use of anæsthetics inadvisable.

Anæsthetics are of use to overcome the

resistance of the muscles which, contracted by pain or fear of pain, oppose the manipulations necessary for reduction, or in case the patient cannot or will not suffer the pain incident to those manipulations. Reduction may usually be effected in "primary" anæsthesia. Ether is safer than chloroform for this purpose.

The choice of the method of reduction depends upon the recognition of the obstacles to reduction. Aside from muscular opposition, the usual obstacle is the resistance offered by untorn ligaments or portions of the capsule to motion in certain directions. Other obstacles are interposition of the ligaments or muscles, and these may be of such a nature as to demand operative interference.

The older methods of reduction by means of direct pressure on the head of the bone or traction by hand, by pulleys, or by electric force have been, in great measure, superseded by the more scientific and practical method of reduction by manipulation, in which, by a succession of gentle movements, the head of the bone is brought opposite the tear in the capsule, the opening is enlarged by relaxation of its sides, and the head of the bone slipped into place by leverage on the untorn portions of the capsule and ligaments, aided, if need be, by traction and pressure on the bone.

In old dislocations the manipulations useful in recent cases are much less likely to succeed, owing to the firm adhesions binding the head of the bone in its new situation and the obliteration of the disused articular cavity. Moreover, strong traction may be required to overcome the contraction of the muscles. Interference in such cases is unavoidably blind and uncertain, and involves much more extensive laceration than took place at the time of the original injury. So many accidents have followed attempted re-

duction by manipulation in these cases that, if cautious manipulation fails to effect reduction, it is better to leave the dislocation unreduced in the majority of cases; or, if the loss of function is so great as to induce the surgeon to run the risk, an open arthrotomy may be done with the hope of dividing the opposing structures, opening up the old socket, and replacing the dislocated bone.

The accidents which follow ill-advised attempts at reduction are usually fracture of the bone or rupture of vessels, leading to hæmorrhage, gangrene, or aneurism. More rarely injury to large nerves has occurred, and even complete avulsion of a limb has been recorded.

After-treatment.—After reduction the joint need usually be kept immobilized only a few days, and excessive motions avoided for a few weeks. Some dislocations require special dressings (*e.g.*, clavicle). Gentle passive motion should usually be begun within at least three weeks to prevent adhesions.

Habitual dislocations have been cured at the inner end of the clavicle by peri-articular injections of alcohol (Stimson) and at the shoulder by injections of tincture of iodine. But this method of producing adhesions offers so grave risks of ankylosing the joint that in the more important joints it is advisable, if the tendency cannot be overcome by the prolonged wearing of an immobilizing apparatus, or one which allows only slight motion, to excise, or take a "reef" in, the lax portion of the capsule.

Congenital Dislocations.—Under this head are included all dislocations supposed to have existed at birth—although sometimes not diagnosed for months or years—and to have been caused by a mal-development of the joint, hydrarthrosis, paralysis, etc. Dislocations produced

traumatically *in utero* or during delivery are excluded.

Congenital dislocations of the hip cover about 90 per cent. of all cases. They are more usual in females than in males. One or both joints may be involved. The typical cases are caused by a defective development of the Y-cartilage and acetabulum, which permits the influence of the weight of the body, or the contraction of the muscles, to drag the head of the bone out of the socket on to the dorsum of the ilium.

Pubic and obturator dislocations are very rare. As the child begins to walk the head is pushed farther upward until it is finally arrested and a new joint formed. The head of the bone is small and deformed and the real acetabulum obliterated. Compensatory changes appear in the pelvis, which is tilted forward, and the lumbar spine, which is curved forward. If one hip alone is involved, there is an additional lateral curvature, and the child limps; if both are involved, there is no limp, but the gait is peculiar. The tilting of the pelvis can be made to disappear by placing the child upon its back and flexing the thighs.

The prognosis as to the utility of the limb is fair. The patient will probably be able to get about, and the deformity will grow no worse.

Treatment. — Inasmuch as operative treatment has a very high mortality and often enough gives but little or no relief, while, on the other hand, some cases—double as well as single—reach adult life, undiagnosed and untreated, with comparatively-slight deformity and no disability except a waddling gait, it is proper—Hoffa and Lorenz to the contrary notwithstanding—to institute treatment by palliative measures. For unilateral dislocations an elevated sole to the shoe,

and, if necessary, an apparatus to prevent the head of the femur from riding up any higher on the ilium, fulfill the indications. Or in cases under 5 or 6 years of age—single or double—prolonged traction, for even as long as two years, may produce material and permanent improvement. Mikulicz claims to be able to effect reduction by manipulation. An injection of a 10-per-cent. solution of zinc chloride above the head of the bone has been advocated for the purpose of strengthening, by new bony formation, the upper rim of the new acetabulum.

Of the operations, that of Lorenz is a type. He makes a vertical antero-external skin incision, divides the fascia lata transversely, separates the muscles, frees the bone by a cross-cut in the anterior surface of the capsule, gouges out the old acetabulum, making a strong upper rim to it, and replaces the bone by extension, aided by a traction apparatus. Immobilization is replaced by passive motion at the end of four weeks, and the child begins to walk with assistance two weeks later. No further apparatus is used. In difficult cases Lorenz advises a preliminary course of two weeks' extension by a thirty-pound weight.

Congenital shoulder dislocations are to be treated according to similar principle.

The anterior knee dislocations are easily reduced, and a good functional result may be predicted.

Pathological Dislocations. — Paralytic ("myopathic") dislocations occur usually in the shoulder, where the deltoid and scapular muscles form such important accessories to the joint.

Dislocations by effusion, erosion, or other articular processes occur in the course of the eruptive, continued, or rheumatic fevers. The hip is commonly affected.

Special Dislocations.

DISLOCATIONS OF THE LOWER JAW.—The dislocations may be single or double. Upward or backward dislocations are very rare. In the former the condyle is driven through the base of the skull, in the latter back through the anterior wall of the external auditory meatus.

Forward Dislocations.—The lower jaw projects forward, the mouth cannot be closed, the condyles may be seen and felt in front of the eminentia articularis. The glenoid fossa is empty. In unilateral dislocations the chin is deviated to the opposite side. The pain is usually not great.

The usual cause of forward dislocations is a wide opening of the mouth in yawning, laughing, or introducing some large object. It is more frequent in women than in men. When the mouth is wide open the external lateral ligament is relaxed and the external pterygoid muscle draws the condyle, and the interarticular cartilage with it, well forward on the eminentia articularis. A slight overaction of this muscle carries the condyle over the summit, whence it plunges forward and upward under the zygoma, and is then held by the balance of forces between the muscles pulling upward and forward and the external lateral ligament pulling upward and backward. The interarticular cartilage accompanies the condyle, at least part of the way. The capsule is not torn.

Reduction is accomplished by opening the mouth more widely to relax the ligament and then pressing the condyle backward and then a little downward. A fairly-successful method is by grasping the jaw on either side with the thumbs on the molar teeth and the fingers under the jaw outside. As the jaw snaps back the thumbs must be quickly slipped into the hollow of the cheeks to avoid be-

ing bit. Reduction of one side at a time is sometimes easier. Anæsthesia may be required to overcome the contraction of the muscles.

Not infrequently this dislocation tends to become habitual. To overcome this the meniscus may be sutured in place. Injection of tincture of iodine has been proposed.

DISLOCATIONS OF THE SPINE.—Dislocation of the lumbar and dorsal vertebræ is almost always complicated by and confounded with fracture. Extension and local pressure have occasionally effected reduction; operative treatment should be resorted to in hopeful cases.

DISLOCATIONS OF THE OCCIPUT (from the atlas) and the atlas (from the axis) have been diagnosed post-mortem. Laceration of the vertebral arteries and the medulla, with or without fracture of the odontoid process, causes instant death in most cases.

DISLOCATION OF THE LOWER CERVICAL VERTEBRÆ.—This may be double or single, complete or incomplete, forward or backward, or bilateral in opposite directions. If the dislocation is unilateral (forward), the head is turned to the opposite side, on which side the muscles are contracted. On the side of the dislocation the dislocated bone may be felt, and its spinous process is deflected toward that side. In bilateral forward dislocations the head may be bent far forward and the dislocated bone (usually the fifth) felt in the back of the neck, or the head may be extended and the bone palpable within the pharynx. The symptoms depend upon the amount of injury to the cord. Damage to the cord above the third cervical vertebræ causes death by cutting off the phrenic nerves. Below this point the result will be a paralysis more or less durable according to the nature of the lesion.

The mechanism of the unilateral forward and bilateral dislocations in opposite directions is abduction (lateral flexion) and rotation, by which the inferior articular process of the upper vertebra is lifted over the superior process of the lower one. Bilateral forward dislocations are caused by hyperflexion, backward by hyperextension and direct pressure.

Treatment.—Reduction should be attempted at once. Unilateral dislocations are to be reduced in the way they were produced; *i.e.*, by abduction and rotation, aided by direct manipulation, so as to lift the disarticulated bone back into place.

Traction and local pressure have proved effectual in the reduction of bilateral dislocations.

After the reduction the patient should be kept quiet for some weeks. A plaster-of-Paris splint for head and neck is advisable.

These means failing, if there seems any hope of recovery by renewing the pressure from the cord, the dislocation should be cut down upon aseptically and an attempt made to reduce it by removing such ligamentous or bony obstacles as may exist.

DISLOCATIONS OF THE STERNUM.—Dislocations—forward or backward—of the body from the manubrium are usually accompanied by serious interference with respiration and circulation. From fracture the diagnosis is made by finding the second costal cartilages attached to the manubrium and torn from their articulation with the body. Inasmuch as the injury is due to great violence, direct or indirect, the associated injuries play a large part in the prognosis. Reduction is effected by dorsal flexion and direct pressure.

DISLOCATIONS OF THE ENSIFORM PROC-

ESS are a tilting either forward or backward. The symptoms are pain and persistent vomiting. Pressure with the fingers or with a sharp hook introduced underneath the skin will reduce the dislocation.

DISLOCATIONS OF THE RIBS AND COSTAL CARTILAGES.—The ribs may be dislocated forward from the spine or forward or backward from each other or from their costal cartilages. The cartilages may be dislocated from the sternum.

The symptoms and treatment are the same as of fracture of the ribs. Reduction, followed by the application of a tight head-band of adhesive plaster three-fourths of the distance around the chest.

Chondro-sternal dislocations usually recur.

DISLOCATIONS OF THE INNER END OF THE CLAVICLE.—The clavicle may be dislocated forward, backward, or upward, in this order of frequency.

Forward dislocation may be complete or incomplete. The head of the bone is prominent and may be displaced inward. The shoulder sinks downward and inward. The arm is useless. There is local pain. This dislocation is usually caused by a forcible depression and pushing backward of the shoulder, by which the centre of the clavicle comes to rest on the first rib, and on it as a fulcrum the inner end is pried upward and forward. By pulling the shoulder upward and backward and pressing on the dislocated bone reduction is affected; but retention is often difficult. Dorsal decubitus with a figure-of-8 bandage about the two shoulders, the turns crossing in the back, may prove effective or may be reinforced by direct pressure by a molded plaster-of-Paris splint, a hernial truss, or a pad retained in position by adhesive plaster. or a figure-of-8 bandage, crossing in front.

If all precautions fail and the dislocation becomes habitual, two or three biweekly injections of alcohol with immobilization may be attempted, or the capsule exposed and shortened.

Backward dislocations may be either complete or incomplete. The head of the bone passes backward and may compress any of the important structures at the root of the neck. This dislocation may be caused by direct violence or by forcing the shoulder forward and inward.



Fig. 3.—Adhesive-plaster dressing for upward dislocation of acromial end of clavicle. (*American Text-book of Surgery.*)

Reduction is effected and maintained by drawing the shoulder backward and outward and retaining it in that position.

Upward dislocation is caused by depression of the shoulder. The head of the bone rests on the episternal notch, having passed behind the sternal head of the sterno-mastoid. Reduction is made by drawing the shoulder upward and outward and pressing the head of the bone down. Here, again, retention is difficult, and Malgaigne's patellar hooks

have been suggested as an adjunct to the treatment.

DISLOCATIONS OF THE OUTER END OF THE CLAVICLE.—The usual variety is upward or upward and outward. Rarely a subacromial dislocation occurs. The so-called subcoracoid dislocations are probably mythical.

Upward Dislocation.—The acromial end of the clavicle rises more or less above the acromion, and may be displaced outward over it. There is frequently fracture of the articular edges. The usual cause is a blow on the shoulder. Reduction is easy, retention difficult. Although non-reduction causes almost no loss of function and but little deformity, Stimson's retention dressing is recommended for its simplicity and efficiency (Fig. 3). A long strip of adhesive plaster three inches in width is placed with its centre under the point of the flexed elbow and its ends carried up in front of and behind the arm, crossing over the end of the clavicle, and secured to the front and back of the chest, respectively, while the bone is held in place by pressure upon the clavicle and elbow.

Recurrence can be readily detected through the plaster. For additional security the forearm should be supported in a sling, and the arm bound to the chest. Care must be exercised not to cause pressure sores over the bony prominences at the elbow.

SUBACROMIAL DISLOCATIONS.—A few cases are recorded in which the outer end of the clavicle was forced down and caught under the acromion. Direct violence and muscular action are the recorded causes. Reduction was easy by drawing the shoulder outward, and there was tendency to recurrence in only one case.

DISLOCATIONS OF THE SHOULDER.—

These dislocations are as numerous as all other dislocations taken together. They are rare in youth and old age, and more frequent in men than in women. This frequency is explicable by the exposure of the joint to trauma and its conformation. The glenoid cavity covers such a small part of the head of the humerus that, in extreme degrees of abduction, extension, or flexion, any force transmitted through the shaft of the bone is applied obliquely in the bony surface and directly on the capsule of the joint, through which the head of the bone is then forced.

In the anterior dislocations the displacement is also more or less downward (and, of course, inward), and in the downward ones it is usually also forward and inward. Thus, the two classes merge into each other. The term "subglenoid" is restricted to those cases in which the head of the bone is very low, others of this class being called "subcoracoid." The accompanying figure (Fig. 4) will demonstrate the different positions assumed by the head of the bone in the anterior-and-downward dislocation.

Anterior Dislocations.—The subdivisions of this variety are dependent

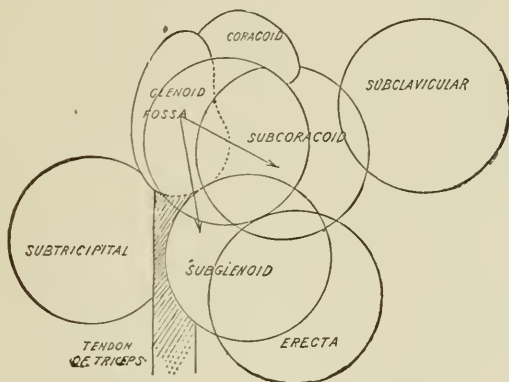


Fig. 4.—To show the range of positions that may be taken by the head of the humerus after primary displacement forward and downward in any of the directions between the arrows. (Stimson, "Dislocations.")

Varieties.—Four divisions may be made according to the direction in which the head of the bone leaves the socket, and these subdivided according to the point at which it comes to rest, or according to the position of the limb, as follows:—

- | | |
|----------------|--------------------------------------------------------------------------------|
| Anterior..... | { Subcoracoid (most common).
Intracoracoid (exceptional).
Subclavicular. |
| Downward... | { Subglenoid (uncommon).
Erecta (very rare).
Subtricipital. |
| Posterior..... | { Subacromial (rare).
Subspinous (very rare). |
| Upward..... | { Supraglenoid (very rare). |

on the increasing amount of inward displacement of the head of the bone, and grow less frequent in the same order; namely, subcoracoid, intracoracoid, and subclavicular.

Subcoracoid.—The head of the humerus lies beneath the coracoid process, in contact with it or at a variable distance—a finger's breadth at most—below it. The head may be displaced inward until three-fourths of its diameter lies to the inner side of the process (farther inward would be subcoracoid) or it may be simply balanced on the anterior edge of the glenoid fossa. The elbow hangs away from the side and the deltoid fullness of

the shoulder is lost (Fig. 5). The axis of the humerus is sure to pass to the inner side of the glenoid fossa, and palpation reveals the absence of the usual bony resistance below the outer side of the acromion, and the presence of an abnormal resistance below the coracoid process, in the axilla, which partakes of rotary movements communicated to the arm. Voluntary movement is usually lost. Passively the arm can be abducted, but not adducted; so that the elbow

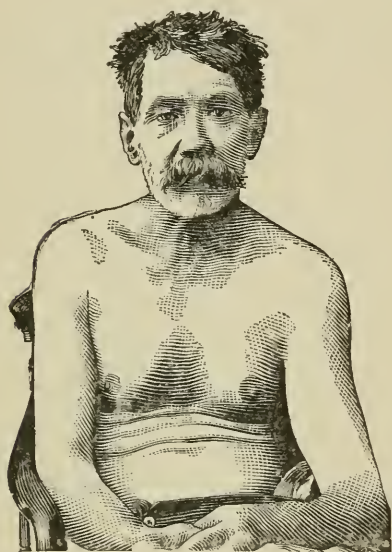


Fig. 5.—Subcoracoid dislocation of the left shoulder. (Stimson, "Dislocations.")

touches the chest, while the fingers rest on the opposite shoulder. Measurement in abduction shows shortening.

The diagnosis is usually easily made by finding the glenoid cavity empty, the head of the bone beneath the coracoid, and by eliciting the above-mentioned sign. If there be fracture of the anatomical neck the head will not participate in movements imparted to the shaft, and crepitus can usually be elicited.

Causes.—Direct violence, by a blow under the shoulder, indirect, as by a fall

upon the hand; by leverage in forcible abduction and outward rotation; or by muscular action in any of the above ways.

Pathology.—The capsule is torn at its inner and lower portion, or, more rarely, stripped up, and with it may be torn the circumflex nerve, the posterior circumflex artery, and subscapularis (Fig. 6). In "typical" cases the outer and upper portions of the capsule remain untorn and aid in determining the abduction. The supraspinatus, infraspinatus, and teres minor may be torn away (in decreasing order of frequency) from the great trochanter or there may be avulsion of more or less of the trochanter itself. With avulsion of the trochanter the tendon of the long head of the biceps may slip to the outer side of the bone and oppose reduction (rarely). This tendon may also be torn. The head of the humerus is often bruised and ground by impact with the edge of the glenoid cavity, which, in turn, is splintered.

Treatment.—In uncomplicated cases reduction is usually easy by Kocher's method, as follows:—

The elbow is flexed to a right angle and pressed closely to the side; then the forearm is turned as far as possible away from the trunk,—external rotation of the arm (Fig. 7). Maintaining the external rotation, the elbow is carried well forward and upward,—flexion of the arm (Fig. 8); and finally the hand swept over until it touches the chest,—inward rotation (Fig. 9),—the elbow being simultaneously lowered. Anæsthetics may or may not be necessary. If, after the "first movement," the head does roll out in front of and below the acromion, the attempt will fail. Direct manipulation of the head may be of assistance.

If Kocher's method fail, traction downward and outward (never upward

and outward, on account of the danger of lacerating the vessels) should be tried. After a long, steady pull, manual or elastic, the deltoid may yield and allow the head of the bone to be pushed back into place. Or, after a few moments of traction, the arm is violently adducted over the closed fist in the axilla (this is safer than the heel). If anæsthetics are used all of these violent measures should be executed very cautiously.

these methods fail, even under anæsthesia, an open arthrotomy should be done for the purpose of discovering and removing the obstacle to reduction.

In intracoracoid dislocations the head is displaced farther inward and the symptoms are those of the subcoracoid, except that the head of the humerus is felt farther displaced and the shoulder is more flattened. The arm may be fixed in horizontal abduction. The cause of

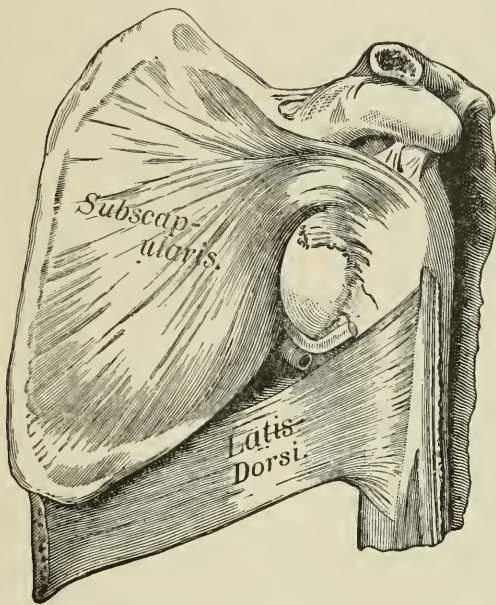


Fig. 6.—Subcoracoid dislocation on a cadaver, showing rupture of lower part of subscapularis. (*B. Anger; Stimson, "Dislocations."*)

Dr. Cole suggests a method which he claims is successful in a large number of cases. The surgeon, standing by the patient's side, holds the arm abducted and the elbow flexed, and, while distracting the patient's attention, gently oscillates the arm. As the deltoid is seen to relax, a sharp blow is delivered into the fold of the elbow and the arm rotated sharply outward, thus rolling the bone into place.

If judicious attempts at reduction by

this particular dislocation is, as a rule, an unusual amount of laceration of the capsule and subscapularis, which allows the head of the bone to slip higher into the axilla. Reduction by outward traction is easy unless the subscapularis or a torn portion of the capsule intervene. In such cases operation is the only recourse.

In subclavicular dislocations the same forces acting more energetically force the head of the bone up under the clavicle.

Downward dislocations include all cases in which the head of the bone lies below the glenoid fossa. In subtricipital

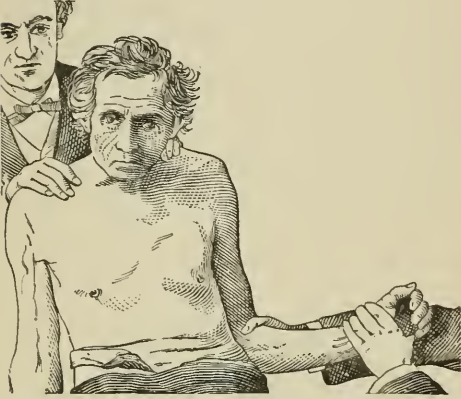


Fig. 7.—Kocher's method of reduction by manipulation. First movement, outward rotation. (Appi, "American Text-book of Surgery.")

dislocation, of which one case is recorded, the head of the humerus was displaced secondarily backward and upward behind the long head of the triceps.

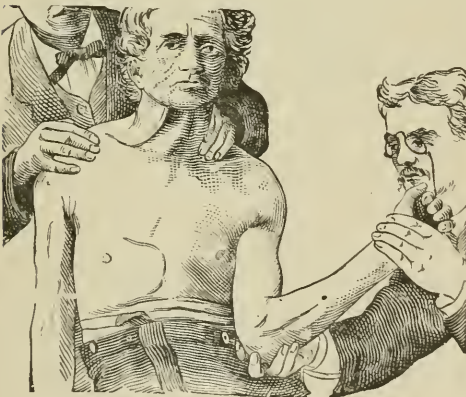


Fig. 8.—Kocher's method of reduction. Second movement, elevation of elbow (Appi, "American Text-book of Surgery.")

Subglenoid Dislocations.—The symptoms are those of subcoracoid dislocation; but abduction and flattening of

the shoulder more marked. The head of the bone is palpable below its socket. The upper part of the greater tuberosity is habitually torn away. The usual cause is forcible abduction followed by rotation or impulsion.

Treatment.—Traction in moderate abduction with direct pressure.

Luxatio Eucta.—Very rarely, by forcible elevation of the arm the head of the bone is displaced so far downward that the extremity maintains its erect position. It is reduced by upward traction until the head falls into place.

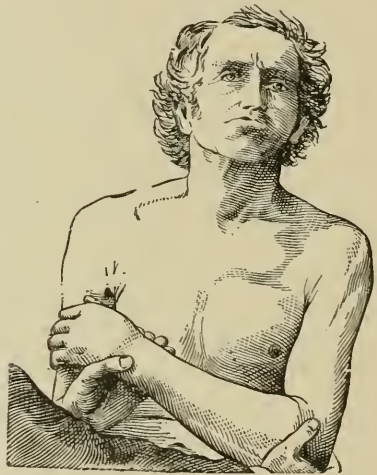


Fig. 9.—Kocher's method of reduction. Third movement, inward rotation and lowering of elbow. (Appi, "American Text-book of Surgery.")

Posterior Dislocations.—The two varieties differ only in the extent of displacement.

Symptoms.—The arm is adducted and rotated in, the elbow being directed slightly forward. The shoulder is flat in front and full behind (when the head of the bone may be felt). Passive motion is restricted, voluntary motion absent.

The cause is direct pressure outward and backward, or the pressure exerted

in the same direction along the adducted and inward-rotated humerus.

The outer side of the capsule is torn and the external and internal scapular muscles more or less lacerated or avulsed with fragments of the tuberosities. The head of the bone lies on the outer edge of the glenoid fossa, or farther back beneath the spine of the scapula, or on the infraspinatus.

Treatment.—Reduction is accomplished by traction and direct pressure forward. Avulsion of the subscapularis makes recurrence probable. Unreduced dislocations backward are accompanied by an unusual amount of disability.

Upward Dislocations.—These are extremely rare. The head of the bone is forced upward between the coracoid and acromion, usually to above the clavicle. The arm is almost immobilized in adduction and slight extension. Reduction may be effected by downward traction.

Complications of Dislocations of the Shoulder.—Compound dislocations are very rare, and are commonly caused by direct violence. The skin-wound is usually in the axilla. Aside from complications which may exist not dependent on the dislocation, the great dangers are from laceration of the main arteries (frequent) or nerves (unusual) and from supuration. The treatment consists of enlarging the wound until the extent of damage can be fully appreciated and, as far as possible, repaired. Meanwhile the wound should be thoroughly irrigated with "normal" salt solution. The dislocation may now be easily reduced. In most cases thorough drainage should be provided for, and in some cases it may be advisable to excise the head of the humerus to this end to oppose ankylosis.

Fractures of the various bony prominences of the scapula and humerus have commonly a purely pathological impor-

tance. Fractures of the anatomical or surgical neck of the humerus are important, but often difficult to diagnose. The diagnostic points of fracture of the anatomical neck are the recognition of the head in the axilla and its failure to move with the shaft, the maintenance of near-by normal range of motion and the normal position of the greater tuberosity. Crepitus may sometimes be elicited. In fracture of the surgical neck the signs are quite the same, except that the tuberosity is displaced with the head, and, with it, fails to move with the shaft, and crepitus is more easily elicited. In either case the upper fragment may be reducible by direct manipulation. This failing, if the fragments can be approximated, the arm may be immobilized for three or four weeks in an appropriate position with the hope of obtaining union and effecting reduction at the end of that time by manipulation. But the better plan is probably to do an open arthrotomy and reserve the upper fragment except in such fractures of the surgical neck as can be reduced, and to this end the use of a strong right-angled hook inserted into a hole drilled at the lower end of the upper fragment, may be of great service (McBurney). Or a fairly-useful false joint may sometimes be obtained at the point of fracture.

INJURIES TO VESSELS AND NERVES.—The axillary itself is very rarely ruptured, and hence the radial pulse may persist, even though there be serious damage to the arteries about the joint. This damage is usually due to ill-advised attempts at reduction, and is recognized by the rapid extravasation of blood down the arm and into the axilla. Treatment is by pressure, ligature of the axillary or subclavian, or disarticulation of the shoulder. The mortality is very high. The circumflex nerve is often torn, with

a resulting temporary or permanent disability of the deltoid and anæsthesia of the shoulder.

TREATMENT OF OLD UNREDUCED DISLOCATIONS.—If the dislocation cannot be reduced after loosening adhesions by forcible (yet judicious) rotation and traction, operation is advisable for reduction by division of the soft parts, or for excision of the head of the bone. A very serviceable joint may be obtained by the latter method; but as the line of divisions of the bone runs below the tuberosities, rotation is practically lost.

Habitual dislocation has been cured by reefing the anterior portion of the capsule. Ricard advises the usual anterior incision between the deltoid and pectoralis, supplemented by a horizontal one along the clavicle and dissection back of the anterior part of the deltoid.

DISLOCATIONS OF THE ELBOW stand second in order of frequency, and are most common in persons under twenty-five. Among the great variety of forms of dislocations of both bones, the backward are by far the most frequent.

The divisions and subdivisions are as follows:—

- | | | |
|--------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------|
| Dislocations of both Bones of the Fore-arm | { | 1. Dislocations backward :
and outward.
and inward. |
| | | 2. Lateral dislocations :
Incomplete { inward.
outward. |
| | | Complete { outward. |
| | | 3. Forward dislocations :
Incomplete (first degree).
Complete (second degree).
With fracture of the olecranon. |
| Dislocations of Ulna Alone | { | Backward and Upward { Incomplete (first degree).
Complete (second degree). |
| | | Backward and Outward (behind the radius).
Inward (one case). |

- | | | |
|----------------------------------|---|-------------------------------------------------|
| Dislocations of the Radius Alone | { | 1. Backward. |
| | | 2. Outward. |
| | | 3. Forward. |
| | | 4. By elongation (the subluxation of children). |
| | | 5. With fracture of the ulna. |

Dislocations of Both Bones Backward.

—The inward and outward subvarieties are of no practical importance.

Symptoms.—The elbow is swelled and partly flexed. The olecranon may be felt displaced backward from the epicondyles and the head of the radius may be recognized behind the external epicondyle as a bony point which rotates with the forearm. The trochlear surface may be prominent in the bend of the elbow; the tendon of the biceps behind. Passive flexion and extension are moderate. There is abnormal lateral mobility in full extension.

The cause is most commonly a fall upon the outstretched hand forcing the two bones backward. The coronoid process of the ulna is either broken or lifted over the trochlear surface by hyperextension or by abduction, which increases the normal outward deviation of the forearm and a twist which swings the process downward and then backward.

Pathology.—The internal lateral ligament is torn, and the external one either torn or stripped away with the periosteum from the external condyle. Hence, in old dislocations reduction is effectually prevented by the mass of callus that forms beneath this elevated periosteum behind the external condyle. The front of the capsule is torn, the epitrochlea (internal epicondyle) may be broken by muscular action, or the muscles attached to it may be ruptured. Fractures of the head of the radius and coronoid process are rare. The latter, however, does not interfere with the action of the brachialis anticus, as that muscle is attached

to the base of the process: a part not interested in the fracture.

Treatment.—Forcible flexion is to be condemned as unscientific and less likely to succeed than pressure on the dislocated bones combined with traction of the forearm in moderate extension or hyperextension. Usually the dislocation is easily reduced. Sometimes anæsthetics are necessary. After reduction the limb should be immobilized by bandages and a sling for about three weeks, after which mild massage and active motion will gradually remove the stiffness. Early passive motion will not hasten the result, and may even increase the excessive production of callus which, in children, sometimes goes on even after reduction and may cause serious limitation to the motion of the joint.

Lateral Dislocations.—Incomplete dislocations in either direction are said to be frequently overlooked or mistaken for fractures. The cause of lateral dislocations is usually a fall upon the hand by which the normal outward angle at the elbow is increased by tearing of the internal lateral ligament and a downward movement of the ulna, directly away from the trochlea. The head of the radius then glides either outward or inward, as the case may be, the ulna following.

In incomplete inward dislocations the forearm is pronated and slightly flexed; its long axis parallel to and a little to the inner side of that of the arm. The olecranon and external condyle are prominent, and the head of the radius can be felt displaced downward and inward, resting below the trochlea (the greater sigmoid cavity of the ulna embraces the epitrochlea). Flexion and extension are but little interfered with. Reduction is made by traction and direct pressure. In unreduced cases there is very little

disability, and operative interference is probably inadvisable.

Incomplete Outward Dislocations.—The forearm is pronated and slightly flexed, and its long axis is to the outer side of and parallel to that of the arm or else in abduction. The ulna is displaced so that the central ridge of the greater sigmoid cavity has passed beyond the outer rim of the trochlea; the radius lies partly below or entirely beyond the external condyle. The internal condyle and olecranon are prominent.

Treatment.—The ridge of the sigmoid cavity must be unlocked from the groove between the trochlea and capitellum. This is done by traction or hyperextension (or by abduction, if the head of the radius rests below the external condyle and can be used as a fulcrum). Then the bones are pushed easily into place. The broken epitrochlea may lodge in the groove of the trochlea and effectually prevent reduction. Even if the dislocation be not reduced, the joint may be quite useful.

Complete outward dislocation occurs in three forms. In the simplest form the bones of the forearm are displaced directly outward, the inner edge of the olecranon resting against the outer side of the external condyle. If, now, the forearm is flexed and strongly pronated, the second form (subepicondylar) is produced, in which the anterior surface of the ulna looks inward and its sigmoid cavity embraces the outer side of the external condyle, while the radius lies above it, with its head in front of the epicondylar ridge. In the third form (supra-epicondylar) the dislocated bones are moved still further upward and backward, so that their articular surfaces lie external to and behind the supinator ridge. Reduction is usually easy, owing to the extensive laceration to ligaments;

but, even if unreduced, the elbow remains fairly strong and mobile.

Forward Dislocation.—This rare injury is usually caused by direct trauma to the back of the flexed elbow. The olecranon was broken in about a third of the cases. If this is the case, the ulna and radius are displaced forward and upward in the anterior surface of the humerus; but, if the olecranon remains intact, it may rest on the trochlea, or, the triceps being torn away, it may pass to the front of the humerus. Reduction by traction appears to have been easily accomplished.

DIVERGENT DISLOCATIONS OF THE RADIUS AND ULNA.—In the antero-posterior variety the ulna lies behind and the radius in front of the humerus; in the transverse the ulna is displaced inward and the radius outward. The usual cause seems to be abduction followed by internal rotation and impulsion. Reduction has failed in one-quarter of the cases.

DISLOCATION OF THE ULNA ALONE.—The forearm is usually extended and adducted. Flexion is painful; rotation free. The trochlea is prominent in front and the olecranon behind, while the head of the radius remains in place. The cause of the injury appears to be hyperextension or abduction, followed by adduction and inward rotation. The rational method of reduction is by supination, abduction, and hyperextension (von Pitha).

DISLOCATION OF THE RADIUS ALONE.—Of the dislocations backward, outward, and forward the last is the most frequent, being, in fact, of not unusual occurrence in connection with a fracture of the shaft of the ulna from a fall upon the hand. The head of the bone is displaced upward in front of the external condyle. The orbicular and anterior ligaments are

torn. Abduction is possible, while supination, flexion, and adduction are all limited. Adduction and pressure appears to be the best method of reduction; but the orbicular ligament may be interposed and require operative interference. The backward and outward dislocations are very rare. They necessitate a fracture of the ulna or a rupture of the interosseous membrane.

The downward dislocation (dislocation by elongation, subluxation of young children) is of frequent occurrence. The clinical history is quite characteristic: a child, usually under three years of age, is pulled by the hand; it cries out, and refuses to use the limb, which hangs with the forearm partly flexed and pronated. The region of the head of the radius is sensitive to pressure, and sometimes an interval can be felt between the radius and the condyle. All passive motions, except supination, are free. On forcible supination a slight click may be felt and the symptoms are at once relieved. Duverney's theory of downward displacement with interposition of the annular ligament is most in accord with the facts.

OLD UNREDUCED DISLOCATIONS OF THE ELBOW.—Adhesions and new bone formation very soon immobilize the joint. If this immobilization occurs in extension, the position may be improved by forcible flexion, with or without fracture of the olecranon. A more accurate method, however, and one likely in many cases to afford fairly-good functional results, is arthrotomy. The chief obstacle to reduction will be found to be the new bone in the great sigmoid cavity. This may be removed and adhesions divided through two lateral incisions, or a U-shaped incision with division of the triceps or olecranon.

DISLOCATIONS OF THE LOWER RADIO-ULNAR JOINT.—The ulna is spoken of as

the dislocated bone. It may be dislocated forward or backward. The latter variety is caused by exaggerated pronation, and the former by direct trauma. Both are easily reduced.

DISLOCATIONS OF THE CARPUS FROM THE RADIUS.—These may be complete or incomplete; forward, backward, or outward. In the incomplete form the cuneiform maintains its relations to the triangular fibrocartilage, while the scaphoid and semilunar are dislocated from the radius. In one case the semilunar alone was not displaced (backward). These dislocations may be complicated by fracture of the anterior or posterior ("Barton's fracture") lip of the radius; but this fracture in no way complicates the treatment and is a purely secondary matter.

The more common Colles fracture of the lower end of the radius was long confounded with backward dislocation. The differential diagnosis is easily made by attention to the relations of the styloid process of the radius with that of the ulna and with the projecting mass on the back of the wrist (Fig. 10). Reduction in either case is made by dorsal flexion and direct pressure, and after reduction the differential diagnosis is easy.

The spontaneous forward dislocation of Madeburg occurs slowly in adolescents as the result of absorption of the anterior part of the articular surface of the radius. The ulna is abnormally prominent; dorsal flexion is limited.

DISLOCATIONS OF THE CARPAL BONES. Dislocations have been reported of each of the carpal bones except the cuneiform. If the bone cannot be pressed into place, and gives rise to annoying symptoms, it had better be removed.

A few dislocations of the second row of carpal bones upon the first have been reported.

CARPO-METACARPAL DISLOCATIONS.—The first metacarpal is the one most commonly dislocated; the dislocation is usually backward and incomplete. The base of the dislocated bone forms a distinct prominence on the back of the hand; this is readily reduced, but as readily recurs. To prevent recurrence, extension of the finger (and also abduction, if it be the thumb) and direct pressure on the head of the bone must be maintained by a dorsal splint for one or two weeks. Habitual dislocations of these joints are often quite painful.

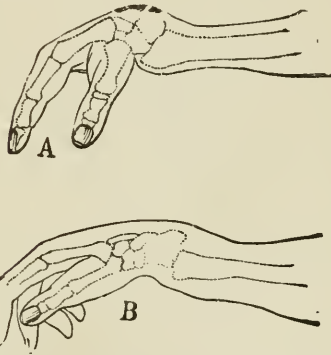


Fig. 10.—Diagrammatic, to indicate the deformity in (A) dislocation of the wrist backward and (B) Colles's fracture of the radius. (Stimson.)

DISLOCATIONS OF THE THUMB AND FINGERS.—*Metacarpo-Phalangeal Dislocations of the Thumb.*—Lateral (one case) and forward dislocations present no especial points of interest. The latter are easily reduced by hyperflexion and traction. Backward dislocations of this joint, however, have long been the subject of controversy, and are treated in some of our latest text-books in a manner none too accurate. This dislocation may be incomplete, complete, or complex. Incomplete backward dislocations may be produced voluntarily by many young persons. It is reduced at will. In the

complete form the phalanx is carried backward and upward on the dorsum of the metacarpal, usually by forced extension, the anterior ligament is torn away from the metacarpal bone and drawn backward with its sesamoid bones along, and even past, the articular surface of the head of the metacarpal, while the tendon of the long flexor slips to one side of the head, usually the inner, al-

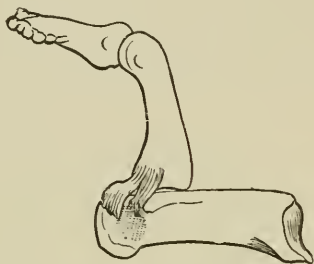


Fig. 11.—Simple complete dislocation of the thumb. (*Farabeuf.*)

though it may exceptionally remain in place. The first phalanx is in extension at a right angle, the terminal phalanx in flexion, and the head of the metacarpal prominent in the thenar eminence (Fig. 11).

In the complex form (produced from the complete by forced flexion of the thumb) the glenoid ligament, and the two sesamoid bones with it, are turned upward so as to lie between the phalanx and the head or dorsum of the metacarpal. The thumb is in straight extension, parallel and posterior to the metacarpal; its base can be felt as a prominence behind, and the head of the metacarpal protrudes in front. The sesamoid bones stand at a right angle to the articular surface of the phalanx, and cannot be folded under it, thus offering a great—often insurmountable—obstacle to reduction. The essential point of reduction, therefore, is to avoid the transformation of the complete into the com-

plex form. The extension must be maintained or even increased and the thumb pressed bodily downward until the anterior edge of its base, following the glenoid ligament, overlaps the articular surface of the metacarpal, when it can be turned into place by flexion. If this fail, a combination of rotation with the downward pressure may succeed: a sort of unbuttoning of the head of the metacarpal from the grasp of the glenoid ligament and the attached heads of the short flexor. If, however, the dislocation has become complex by the interposition of the glenoid ligament, the same method may yet succeed; but much more forcible downward traction is necessary to carry the edge of the ligament over the end of the metacarpal bone ahead of the phalanx before instituting flexion. If all manipulations fail, the joint must be opened through a longitudinal anterior incision, and the centre of the glenoid ligament nicked deeply enough to allow it to be drawn over the head of the metacarpal, after which the dislocation may be readily reduced.

Metacarpo-phalangeal dislocations of the fingers present the same features as



Fig. 12.—Complex dislocation. (*Farabeuf.*)

those of the thumb, save that they usually have no sesamoid bones.

Dislocation of the phalanges may occur in any direction. Reduction is usually easy, though it is possible that the thick anterior ligament may be interposed, as in the metacarpo-phalangeal joint.

DISLOCATIONS OF THE PELVIS AND COCCYX.—Dislocation of the pubic and sacro-iliac symphyses occurs in connec-

tion with fracture of the pelvis, the symptoms and treatment of which it does not materially complicate.

The coccyx may be dislocated forward or backward. The pain is usually intense. Diagnosis and reduction are effected by rectal touch. The tendency to recurrence can only be remedied by excision of the bone.

DISLOCATIONS OF THE HIP.—These form from 2 to 10 per cent. of all dislocations; they occur at all ages and are more common in men than in women. The head of the femur may leave its socket in any of the four principal directions, after which it assumes various positions by secondary displacement. In "typical" dislocations the Y-ligament remains untorn and determines the characteristic attitude of the limb (Bigelow). Compound dislocations are rare. The varieties are as follows:—

Dislocations { "Typical" dorsal (comprising the
Backward { iliac and "ischiatric," and those
 { "upon the dorsum ilia" and
 { "into the ischiatic notch").

Dislocations { Anterior oblique.
Backward { Everted dorsal (comprising the
 { "supraspinous" and some of
 { the "supracotyloid").

Dislocations Downward { Obturator.
and Inward { Perineal.

Dislocations {
Forward and Upward { Suprapubic { Ilio-pectineal.
 { Pubic.
 { Intrapelvic.

Dislocations directly upward (supracotyloid or subspinous).

Dislocations downward on the tuberosity of the ischium.

Backward Dislocations.—The dorsal form is by far the most common of the dislocations of the hip. The thigh is adducted, rotated inward, and more or less flexed; so that the knee rests upon the front of the opposite thigh when the patient is recumbent, and there is apparent shortening (Fig. 13). The upper and outer part of the thigh is broadened, and

the trochanter is above Nélaton's line (a line drawn from the antero-superior spine of the ilium to the tuberosity of the ischium). The head of the femur may be obscurely felt in the buttock.

The actual shortening cannot easily be determined on account of the difficulty of placing the two limbs in symmetrical positions. Voluntary movement and friction are lost; passive flexion and adduction alone are possible.

The characteristic position and limita-

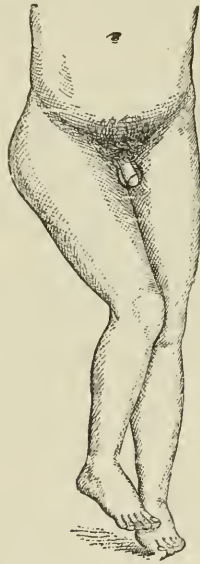


Fig. 13.—Dorsal dislocation of femur.
(Cooper.)

tion of motion readily distinguishes the dislocation from a fracture of the neck of the femur.

Etiology.—The dislocation is usually produced by violence transmitted along the shaft of the femur while the thigh is flexed, adducted, and rotated inward; or the head of the bone may be thrown out of place by exaggerated adduction, inward rotation, and slight flexion; or, again, the dislocation may result second-

arily from an obturator dislocation by the same three motions.

Pathology.—The head of the bone usually tears through the capsule low down behind, passes below and then upward behind the obturator, and rests finally on that muscle close behind the acetabulum, or, more rarely, it leaves its socket higher up, pushes the obturator ahead of it outward or upward, and lies on the edge of the acetabulum itself. The capsule is irregularly torn behind, the ligamentum teres is ruptured, the quadratus femoris and gemelli are usually torn, the two obturators and pyriforms less fre-

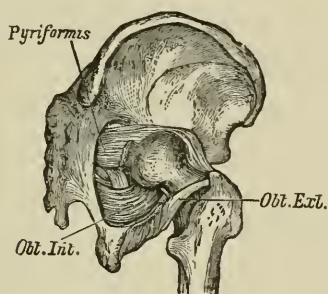


Fig. 14.—Dislocation below, and then behind and above, the obturator internus. (Stimson.)

quently. Rarely the head of the bone rests on the great sciatic notch or the dorsum ilia. The edge of the acetabulum may be shattered and the head of the bone split.

Treatment.—The surgeon must endeavor to relax the Y-ligament and other untorn portions of the capsule, to bring the head of the bone opposite the rent in the capsule (if necessary) and then to lift or pry it into place. To do this the patient is laid flat on his back and the pelvis steadied by an assistant or by the surgeon's foot. The patient's knee is then flexed at a right angle, the thigh rotated inward and flexed to or a little

beyond a right angle, and then lifted bodily upward, rotated a little outward, and extended in abduction. The lifting and outward rotation should replace the bone with a distinct jump.

Or the patient may be laid on his face on a table, whose edge comes just above the groin, so as to leave the lower extremities dangling. The sound limb is now held horizontally by an assistant, and the dislocated one allowed to hang vertically downward. The surgeon grasps the ankle of the dislocated limb, flexes the knee to a right angle, and, while diverting the patient's attention, swings the limb gently from side to side. Under the influence of gravity the muscles soon relax and the bone may slip into place of itself or aided by a sharp quick pressure downward on the calf.

If these methods fail, ether should be administered and reduction attempted several times by the first method. Failing again, try traction in slight flexion and adduction, aided by direct pressure on the great trochanter.

If the limb is too strongly flexed or too soon rotated outward the dorsal dislocation may be transformed into a thyroid one. If this occurs, the dislocation must be restored to its original form by reversing the movements: flexion in abduction and outward rotation, followed by adduction and rotation inward.

Everted Dorsal Dislocations.—If the outer branch of the Y-ligament is ruptured, the limitation to abduction and outward rotation is, in great part, removed, and the head of the bone is free to rise higher than before. Hence, when this rupture occurs, if the head remains behind the acetabulum only slight flexion and adduction persist, while, if it has moved upward and forward near to or above the antero-inferior spine of the ilium (in which position it can be felt),

there will be extension, abduction, and slight outward rotation: the so-called everted dorsal. Reduction is effected by converting the dislocation into the common dorsal form and treating it as such.

Anterior Oblique Dislocation.—In Bigelow's one reported case the head of the bone was high above the acetabulum and the limb crossed the opposite thigh, everted, and with the knee extended. Reduction as for everted dorsal dislocation.

Dislocations Downward and Inward.—In both the obturator—or thyroid—and perineal varieties the head escapes through a rent in the lower and inner part of the capsule to lodge on the obturator foramen, or to proceed farther and rest on the perineum. In either case the limb is flexed, abducted, and rotated outward. It cannot be extended and can only be adducted after flexion. The limb is shortened, the trochanteric region flattened, and adduction tense. The head of the femur may sometimes be felt on the foramen, always if it is in the perineum, in which latter case the abnormality of the position of the limb is much greater. Several patients are reported to have walked immediately after receiving a thyroid dislocation.

The common cause is violence received on the back of the pelvis while the thigh is somewhat flexed and abducted; but it may be extreme abduction alone. In perineal dislocations the laceration of the soft parts must be extensive.

Reduction is made by flexion of the hip to a right angle, traction with adduction, and then inward (or outward) rotation while lowering the knee. Manipulation may succeed with no rotation at all.

Dislocations Upward and Forward, and Inward and Forward (Suprapubic).—The limb is extended, markedly everted,

and slightly abducted. The head of the femur is commonly to be felt in the groin (ilio-pectineal form) or may be above the pubes. The psoas-iliac and the great vessels are stretched across the head or may be ruptured. The head of the bone may have left the socket at its upper and inner part by hyperextension, or by abduction and outward rotation, or the dislocation may be secondary to an obturator dislocation.

Reduction.—The head is to be drawn downward past the pubic ramus by direct traction in the axis of the limb as it lies; then flexion is instituted while pressure is made against the head to prevent its moving upward again; and finally inward rotation replaces the bone.

Dislocations Directly Upward (Supracotyloid).—In the few recorded cases the head had been forced directly upward and lay just beneath the antero-inferior spine of the ilium. The limb was everted and abducted. Some of the patients have been able to walk with a limp.

These cases bear a close resemblance to everted dorsal dislocations. No definite rules for reduction have been laid down.

Dislocation Downward Upon the Tuberosity of the Ischium.—This dislocation is very rare because of the ease with which it may be converted into a dorsal or thyroid dislocation. The thigh is sharply flexed and abducted. Reduction is easy by traction in flexion.

Complications of Dislocations of the Hip.—Compound dislocations are very rare.

Injury to the femoral vessels may occur in forward and inward dislocations.

Fracture of the neck of the femur is usually caused by overzealous attempts at reduction. Ankylosis with the limb in a favorable position is the best that can be hoped for, except possibly in the

young, when excision of the head of the bone may give some useful motion.

Treatment of Old Unreduced Dislocations.—Of the operative procedures, reduction by arthrotomy gives a long list of deaths as opposed to two successes (by Parkes), while excision of the head, or of the head, neck, and trochanter, and subtrochanteric osteotomy have frequently decreased the disability. In many cases, however, the patients do reasonably well without operation, and these persons need expect no cure from the knife.

DISLOCATIONS OF THE KNEE.—These occur rarely and, in order of frequency, forward, backward, outward, inward, and

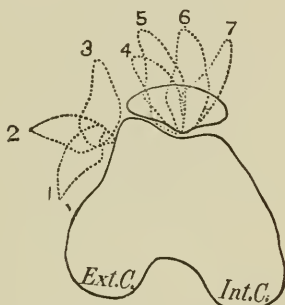


Fig. 15.—Diagram of the various dislocations of the patella. (Stimson.)

by rotation. The dislocation is frequently compound, and the prognosis rendered much more grave by a complicating injury to either of the popliteal nerves or to the popliteal vessels. Even if, after reduction, pulsation reappear in the arteries of the foot, gangrene may supervene from thrombosis caused by laceration of the inner coats of the artery.

Forward dislocation may be complete, or, more commonly, incomplete. When complete, the tibia may be displaced some distance upward over the front of the condyles. If the dislocation is compound, the wound is posterior and transverse. The cause is direct violence or

hyperextension of the knee. Reduction is easily made by traction and pressure.

Backward dislocations may be complete or incomplete. The leg is usually either extended or hyperextended, and may be deviated to one side. The patella may be dislocated outward. The usual cause is direct violence. Reduction is effected by traction and pressure. Even without reduction a fairly-useful limb has resulted in several cases.

Lateral dislocations are outward or inward, complete or incomplete. The patella is usually deviated toward the side of the dislocation. The incomplete form is usually caused by abduction or (inward) by adduction. Reduction by traction and pressure. Dislocation by rotation is said to be incomplete when one condyle revolves around the other, complete when both revolve around a central axis. There may be additional backward or outward displacement. The rotation is said to be outward or inward according to the direction in which the toes turn. Reduction is easy. All knee-dislocations should be kept immobilized for several weeks after reduction.

DISLOCATION OF THE SEMILUNAR CARTILAGES.—Either cartilage may be detached from any of its ligamentous attachments, and so displaced in any direction, or it may be lacerated.

The symptoms are those of any loose body in the joint, sudden painful locking, usually after some given movement. The displacement may be recognized by palpation along the articular edge of the tibia. The cause of displacement is a dislocation, a sprain, excessive rotation, or flexion.

Treatment.—The locking may be relieved by forcible manipulation or by pressure upon the displaced cartilage. Various braces have been devised to prevent recurrence, either by opposing the

displacement directly or by preventing the motion which occasions the displacement. These methods failing, the cartilage may be removed or sutured into place through an exploratory incision alongside of the patella.

DISLOCATIONS OF THE PATELLA.—The patella may be dislocated outward or inward or rotated around its long axis, or the two forms may be combined. Displacement upward or downward is purely secondary to rupture of the ligamentum patella or the quadriceps tendon, and need not be here considered.

Outward dislocation is complete or incomplete, and accompanied by various degrees of rotation (Fig. 15: 1, 2, and 3). The patella is readily felt in its new position, though it may be difficult to determine whether the outer or the inner border is directed forward. Muscular action or direct violence are the causes of the dislocation, and hydrarthrosis and ligamentous weakness are predisposing causes. The fibrous expansion of the vastus internus is ruptured, and the muscle itself may be more or less torn. Reduction is made by direct pressure during extension of the knee and flexion of the hips.

Incomplete dislocations are those in which, during extension or flexion, the patella moves outward on to the external condyle.

Outward, Edgewise, or Vertical Dislocations (by Rotation).—In these the patella is moved outward and its inner edge backward into the intercondylar groove; so that its articular surface looks outward and more or less forward, or completely forward (Fig. 15: 4 to 7). The causes and treatment are the same as for outward dislocations.

Inward dislocations present the same features, *mutatis mutandis*, as the outward, but they are much less frequent.

Habitual dislocations are usually the result of some deformity, such as genu valgum. They are controlled by correcting the original deformity or by apparatus, or by tightening up the loose lateral ligaments (by operation).

DISLOCATION OF THE FIBULA.—The upper end may be dislocated outward and forward, or backward, or upward. These dislocations are all rare. The first form seems to be caused by muscular action of the long extension of the foot; the second (in more than half the cases) by action of the biceps, and the third by an injury resembling Pott's fracture, in which the fibula, instead of being broken, was forced upward.

A complicating fracture of the tibia may exist. Recurrence is likely, although reposition is easy, and hence immobilization should be maintained for several weeks.

The lower end may be dislocated backward. This is quite as rare as the dislocation outward in connection with Pott's fracture is common.

DISLOCATION OF THE ANKLE (TIBIO-TARSAL) BACKWARD.—By extreme plantar flexion the lateral ligaments are torn, the foot slips back, and the astragalus is caught behind the tibia. (Incomplete dislocation is a frequent accompaniment of Pott's fracture.) The malleoli may be fractured. The lengthening of the heel and shortening of the foot may only be determined sometimes by careful measurement.

Forward.—Rare. Caused by pressure on the heel or by exaggerated dorsal flexion.

Inward.—Two varieties. In the one the astragalus is pried out by suppuration and adduction, and the foot moved directly inward and forward; in the other (thought to be secondary to a backward dislocation) the foot is turned over

so that its plantar surface faces directly inward. Reduction is easy.

Outward.—Appears always to be associated with Pott's fracture.

SUBASTRAGALOID DISLOCATIONS.—The other bones of the foot may be dislocated from the astragalus outward, inward and backward, forward, or backward. The first two are the most common. About 50 per cent. are compound. About 50 per cent. of attempted reductions have succeeded. Complicating fractures are not infrequent. Notwithstanding the persistence of the displacement, a good functional result may be obtained in some unreduced cases. Primary and secondary excisions of the astragalus and amputations give various results.

DISLOCATIONS OF THE ASTRAGALUS.—The varieties are forward, backward, outward and forward, inward and forward, and by rotation. There is frequently more or less rotation in connection with the other displacements.

Outward and Forward.—This is the most frequent form. The foot is adducted and inverted and the external malleolus prominent. The astragalus rests on the outer cuneiform and cuboid bones, or even on the fifth metatarsal. Its posterior part is still in contact with the articular surface of the tibia. Reduction by traction on the foot and pressure on the astragalus is usually easy, unless the bone is rotated.

Inward and Forward.—The foot is abducted and everted and the astragalus lies in front or below the malleolus. Reduction may be prevented if the tendon of the tibialis anticus embraces the neck of the dislocated bone.

Forward.—Very rare. The cases reported have no features in common.

Backward.—There may be lateral displacement. In about 50 per cent. of

cases the bone was broken at the neck and only the posterior fragment dislocated. There may be flexion of the terminal phalanx of the great toe. Reduction was effected in one-third of the simple cases.

Rotatory.—Dislocation by rotation alone may take place about the vertical or transverse axis (in these latter there is always some displacement forward and inward) or about the antero-posterior axis.

DISLOCATIONS OF THE TARSUS AND METATARSUS.—These dislocations resemble those of the carpus and metacarpus (*q. v.*). The external cuneiform alone has not been dislocated individually.

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DYSENTERY.—Gr., *δυσ*, difficult, and *εντερον*, intestine.

Definition.—An acute or chronic inflammatory disease, which usually affects the large, but sometimes the small, intestine. The structures implicated are the solitary and more rarely the agminated nodules, and the general enteric mucous membrane. Under this name are described several different forms of intestinal flux, which in the acute stage are characterized by fever and accompanied by tormina and tenesmus.

Varieties.—Several different forms of dysentery are distinguished partly upon anatomical and partly upon clinical and etiological grounds. A division into endemic, epidemic, and sporadic has been made. It is probable that the endemic, or tropical, form owes its origin to a definite species of micro-organism, the *amœba coli*. The epidemic and sporadic varieties are of uncertain etiology. For clinical purposes a separation into

catarrhal, diphtheritic, and amœbic dysentery may be made.

General Symptoms.—The first symptoms of dysentery usually set in without prodromata. A natural movement is followed by several diarrhœic stools without either pain or tenesmus. The size of the movements gradually diminish, they become admixed with mucus and blood, and are accompanied by colic, borborygmi, and tenesmus. It sometimes happens that the disease is ushered in with bloody and mucous stools, pain, and tenesmus. In light grades constitutional symptoms are scarcely present; in severe ones the disease begins with chill, fever, loss of appetite, nausea, and faintness. The evacuations remain diarrhœic and contain only mucus, when we have to deal with a mild catarrhal inflammation, or they become admixed with blood, pure bloody, pseudomembranous, or purulent, indicating more severe lesions.

The several kinds of dysentery present different stages. The epidemic and sporadic forms may be separated into catarrhal, diphtheritic, and ulcerative stages. The endemic form, and especially the amœbic variety, appears in the ulcerative stage almost exclusively. The last also shows a greater tendency to become chronic and to relapse.

SPECIAL SYMPTOMS.—(A) *Catarrhal Dysentery.*—In this form prodromata, except dyspepsia and slight abdominal pains, are rare. Diarrhœa is the most constant initial symptom and at first it is not painful. The characteristic features of the disease—colicky and griping abdominal pain, frequent stools, and straining—are usually developed within the first thirty-six hours. The constitutional symptoms are, as a rule, insignificant; the temperature is little elevated; the pulse rarely exceeds 100; the tongue is, at first, furred and moist, but

later becomes red and glazed; nausea and vomiting may be present. The abdomen may be flat and hard and the thirst excessive. There is constant desire to go to stool. The stools present the following characters: During the first twenty-four or forty-eight hours they consist of more or less clear mucus and blood, with small, scybalous masses. Under strict *regimen*, as early as the second day, they may be composed entirely of mucus and blood, and their consistency may be so viscid that the bedpan may be turned upside down in many cases without spilling the contents. The number of stools in twenty-four hours varies from 15 to 200. This condition may persist for one or two weeks, the mucus becoming gradually more opaque, of a grayish-white color, the blood progressively diminishing in quantity, and a little gray, green, or brown pultaceous *detritus*, or fluid fæcal matter, appearing in the stools. As the disease subsides, fæcal matter again makes its appearance, increasing in amount until fully-formed fæces are passed, showing neither mucus nor blood. In the more prolonged cases wholly pultaceous, yellow-brown or greenish (spinach) evacuations may intervene between the bloody, mucoid stools and the passage of formed fæces. Microscopical examination of the stools shows in the first bloody, glairy discharges a predominance of red blood-corpuscles. With these are associated leucocytes and cylindrical epithelial cells in small numbers, and constantly large round or oval epithelioid cells. In later stages the stools contain fewer red corpuscles and more leucocytes; in the pultaceous material cellular elements are scarce. Bacteria are more abundant in the later stages; amœbæ are absent; occasionally the *Cercomonas intestinalis* is seen in large numbers. The duration of

the disease is variable; according to Flint, the milder cases terminate in about eight days; severe ones may last as long as a month. The disease rarely becomes chronic.

(B) *Diphtheritic Dysentery*.—The primary variety presents somewhat different symptoms, depending upon the stage—whether acute or chronic—of the disease. In the *acute* stage the symptoms often from the outset are severe. There may be high fever, great prostration, abdominal pain, and frequent discharges, with tormina and tenesmus. The griping pain and straining are the chief sources of suffering. Delirium may set in early, and the clinical features resemble severe typhoid. Osler states that he has known this mistake to be made on more than one occasion. The pulse, in the majority of cases, is but little, and sometimes not at all, accelerated. Fever, except in the severe cases, is not a prominent feature. Flint states that great frequency of the pulse denotes gravity and danger, but that the converse does not always hold good. The discharges are frequent and diarrhoeal in character; blood and mucus may be found early, and sloughs may make their appearance. The presence of pseudomembranes and of necrotic portions of the intestinal coats is characteristic of the diphtheritic form of inflammation. The other ingredients are common to both the catarrhal and the diphtheritic varieties of inflammation. Upon microscopical examination the cellular elements are found to be relatively few in numbers, those most constantly present being cylindrical epithelial cells, showing more or less fatty degeneration. Red blood-corpuscles and leucocytes are observed, especially where much blood and mucus are admixed, and large numbers of leucocytes in the purulent discharges.

Fibrin also occurs, and bacteria appear in great numbers. When improvement begins feculent matter appear in the stools. The duration of the disease from the date of attack to convalescence varies from four to twenty-one days. When death takes place it usually results from asthenia. The pulse becomes weaker and accelerated, the tongue dry, the face pinched, the skin cool and covered with sweat, and the patient sinks into a drowsy condition. Consciousness may be retained until the end.

(C) *Chronic Dysentery*.—This condition usually succeeds an acute attack. Clinically the chronic forms of diphtheritic are not sharply marked off from those of amœbic dysentery. The latter disease may be subacute from the outset and fail to present an acute period. The lesions in the intestine will depend upon the origin: if amœbic, then ulceration with little tendency to healing is the rule; if diphtheritic, then pigmented cicatrices or these together with imperfectly-healed ulcers are met with. The intestinal walls are thickened and the sigmoid flexure may be palpated as a hard, resistant tube. The disease presents protean symptoms and cannot always be sharply separated from chronic diarrhoea. Its course may extend over months and even years. Many of the characteristics of the acute disease are wanting. The composition of the stools is variable; blood, necrotic tissue, and pseudomembranes are rarely found. There are periods of improvement and exacerbation; the patient loses weight and strength, becomes emaciated, suffers from periods of psychical depression, and may become bedridden. The degree of emaciation may be extreme, and a severe secondary anæmia sometimes develops. The evacuations—which vary from five to twelve or more

in the twenty-four hours—take place usually without tenesmus, and with only slight colicky pains. They are fluid, of greenish-yellow or brownish-black color, now and then admixed with blood and mucus. Sometimes the stools are purulent. Indiscretions in diet are followed by an increase in the colicky pains.

(D) *Amœbic Dysentery*.—The symptoms presented are very variable. What characterizes the disease are an “irregular course marked by periods of intermission and of exacerbation of the diarrhœa, a tendency to chronicity, and the frequent occurrence of abscess of the liver” (Lafleur). For clinical purposes Lafleur groups the cases under (a) grave or gangrenous forms; (b) dysentery of moderate intensity (showing periods of intermission and of exacerbation); (c) chronic forms. Kartulis recognizes catarrhal and ulcerative stages in the diseases. The catarrhal stage, in contradistinction to epidemic dysentery, is relatively of infrequent occurrence. This stage tends to pass into the more severe or ulcerative form. In the catarrhal stage the dejections are yellow, bile-stained, and of mushy or fluid consistence. When the stools are small, then mucus, which may be blood-stained, appears. As the intensity of the symptoms increases clumps of mucus and blood are more abundant; still later the stools present a beef-water appearance, in which clear clumps, resembling frog-spawn, — altered starch-grains, — float. With the advance of the ulceration they become more copious, watery, and less homogeneous; there is less blood and a great deal of shreddy material appears admixed with the mucus. Fragments of necrotic tissue from the bases of the ulcers,—small, grayish-yellow masses,—which always contain amœbæ, are present. When there is great and rapid

sloughing, then the stools are greenish, grayish, or reddish brown and are still more variegated in appearance. In consistence they are watery or pultaceous and in odor penetrating and highly offensive. In the chronic form the stools are homogeneous, watery, or gruel-like; they contain few or many flakes of clear mucus, but seldom any blood or necrotic fragments of tissue.

The microscopical examination of the bloody, mucoid stools shows red blood-corpuscles, leucocytes, oval and round epithelioid cells, cylindrical epithelial cells in small numbers, crystals of ammonia-magnesian and earthy phosphates, Charcot’s crystals, occasionally blood-pigment, and amœbæ. At later stages the cellular elements are less numerous, the amorphous *detritus* increased, and elastic tissue may be met with. In the liquid stools of the chronic form few formed elements except amœbæ occur. With each exacerbation there is an increase of the cellular elements.

In the grave form the stools are, at first, numerous, twenty to thirty in twenty-four hours; as the disease advances they diminish to a dozen or less, and in fatal cases, toward the end may not exceed three or four.

Abdominal pain and tenesmus are frequently present at the outset, especially in severe cases, but may be entirely absent. Vomiting and nausea are only occasionally observed. Fever is an inconstant symptom and ranges from 99° to 101° or 102°. With the development of complications (liver-abscess, etc.) it is more persistent and tends to become more regularly intermittent. The pulse, in most instances, follows the variations in temperature. In the fatal stage of gangrenous dysentery the pulse becomes rapid,—120 to 140 or more—thready, and compressible; and at the same time

the temperature tends to fall below normal. Anæmia, of greater or less severity, appears in all cases; albuminuria of slight grade is of frequent occurrence, and hyaline casts are sometimes found in the urine.

The examination of the stools for the *amœbæ coli* is very important and should never be omitted. Sometimes a single examination suffices to demonstrate actively-moving *amœbæ*. In chronic cases, however, repeated examinations may be required. In cases of liver- and of lung-abscess the diagnosis of the intestinal disorder may be established by finding the *amœbæ* in the aspirated contents of the former or in the sputa derived from the latter. In making the examinations for *amœbæ* it is advised that the stools be passed into a warm bed-pan and kept at the body-temperature during the observation. The examination should be made at once or very soon after collecting the *fæces*, and the most favorable parts should be chosen for the examination. A warm stage greatly facilitates the examination.

Special symptoms referable to complications are apt to arise. Those most commonly met with are in connection with liver- and lung-abscesses, peritonitis with or without perforation of the intestine, and intestinal hæmorrhage.

The duration of the disease in uncomplicated cases varies from six to twelve weeks. Recovery is tedious, relapses are frequent, and there is a constant tendency to chronicity. In uncomplicated cases recovery may be expected when the *fæces* become formed and *amœbæ* disappear from the stools.

Complications. — A local peritonitis may arise by extension, or a diffuse inflammation, which is usually fatal, may follow perforation. A local inflammation about the cæcum gives rise to peri-

typhlitis; if about the rectum, periproctitis. The regional lymphatic glands may be swelled and hyperæmic, and rarely do they undergo suppuration. A serious complication is pylephlebitis affecting the veins of the intestine and mesentery, owing to the danger of embolic abscess of the liver. The abscesses, in these cases, may be single or multiple. Intestinal stricture is a rare sequence; amyloid degeneration of the viscera and dropsical conditions are uncommon consequences of chronic dysentery. The diseases associated with dysentery which have been noted are rheumatic swelling of the joints, malaria, typhoid fever, pleurisy, pericarditis, and endocarditis.

Three cases of paralysis in dysentery and in chronic diarrhoea of warm countries. Peculiarities: it was less and less complete in going from the centre toward the periphery; improvement was in the inverse order from the extremities toward centre; muscles most completely paralyzed were the last to be cured; paralysis was not always complete; frequently paresis only. Due to a lesion of the anterior cornua of the cord. Pugibet (*Revue de Méd.*, Feb. 10, '88).

Seven cases of *amœbic* dysentery. The nature of the disease being such as to produce very rapid anæmia and wasting, it is necessary to combat these results by the plentiful use of nitrogenous food: meat, fowls, eggs, rich broths, milk, etc.; if restricted to a milk diet, these patients will very rapidly fail. West (*Med. Record*, Sept. 23, '93).

Case complicated with external otitis and phlegmon of the mastoid process 17 days after the appearance of the intestinal affection. The bacterium *coli* was found in the suppuration. Gasser (*Archives de Méd. et de Pharm. Milit.*, No. 6, '95).

Case of severe dysentery complicated with infectious pseudorheumatism, arthritis, with sero-purulent effusion of the left knee, necessitating arthrotomy and drainage of the articular *cul-de-sacs*. J. Brault (*Lyon Méd.*, Jan. 27, '95).

Three cases complicated with nephritis, diagnosis in two being confirmed by autopsy. Such cases sometimes are so insidious in evolution that the nephritis is unperceived not only during the dysentery, but even long after the cure of the original disease. On the contrary, in other cases or under less favorable conditions the symptoms of nephritis are very plain. Troitzky (*La Méd. Mod.*, June 8, '95).

Literature of '96-'97-'98.

Case in which abscess of the liver occurred six years after tropical dysentery. Berger (*Gaz. Hebdom. de Méd. et de Chir.*, July 18, '97).

Case of dysentery complicated with intussusception; death. Intussusception found to be caused by the invagination of the ileo-cæcal valve into the ascending colon. Extensive dysenteric ulceration was present throughout the length of the large intestine. W. G. Pridmore (*Brit. Med. Jour.*, Apr. 17, '97).

Diagnosis.—The diagnosis of dysentery usually involves no great difficulty. The characteristic evacuations are pathognomonic. The diseases from which it is to be discriminated are local affections of the rectum, such as syphilis and epithelioma, which may produce tenesmus with the passage of mucoid and bloody stools, and hæmorrhoids, and a discharging intestinal abscess, in which certain of the symptoms are simulated.

Etiology and Epidemiology.—Dysentery is one of the four great epidemic diseases of the world. In the tropics it destroys more lives than cholera, and it has been more fatal to armies than powder and shot (Osler). From the accounts furnished by history and the numerous ones supplied by physicians in the last three centuries bearing upon its epidemiology, it may be concluded that, just at present, dysentery has at all times had the widest distribution over the globe and that no considerable part has been exempted from a visitation. To

quote Ayres, "of dysentery it may be said that, where man is found, there will some of its forms appear."

The present geographical distribution of dysenteric and diarrhœal diseases is compared by Hirsch with that of the malarial diseases, with which, in respect to the manner of their endemic prevalence, the frequency of their epidemic outbreaks, and the varying severity of their type, they are in correspondence.

Like the malarial diseases, they reach the maximum of diffusion and of intensity, and more especially their greatest severity as an endemic, in equatorial latitudes; in subtropical countries there begins to be noticed a decrease in the extent and seriousness of endemic and epidemic incidence; while in still higher latitudes they almost disappear as endemic diseases and show themselves merely now and then in epidemics over an area at one time large and another time small. In one point they differ from malarial diseases, namely: that they attain to higher latitudes of the cold zone, appearing as epidemics in regions that are quite free from malaria.

The *endemic* form of dysentery has always existed in Africa and India, but the place of its natural home is not known. Its present distribution includes Africa in its entire extent, except for a few localities. Both natives and Europeans are affected. In South Africa it prevails severely in Bechuanaland, Natal, and the Transvaal. In the north it appears in Egypt, especially along the coast and the Nile delta. In Asia it prevails to a great extent along the Arabian coast of the Red Sea as well as of the Gulf of Aden and the Persian Gulf. It exists in Syria, Asia Minor, and extends into Mesopotamia and Persia. Endemic dysentery is widely disseminated in India and the Indian Archipelago and exists in China.

In Japan it assumes a milder form, while the epidemic variety is very destructive. The disease prevails in the tropical and subtropical parts of South America, but it fails to reach the wide diffusion which it presents in Africa and India. In Guiana it is found in the mountainous regions and in the tropical parts of Brazil in a severer form. In Valparaiso and La Serena in Chile the disease has a home. Foci appear in Paraguay and in the tropical provinces of Argentine Republic. In Peru it occurs along the marshy districts of the Amazon and in some of the mountainous regions, being endemic in the city of Cero de Pasco at an elevation of 13,000 feet. Venezuela does not escape; in Uruguay it is almost unknown. In Central America the disease prevails in Panama, Costa Rica, Nicaragua, Salvador, Honduras, and Guatemala. It is diffused over Mexico and appears at elevations of 6000 feet. It assumes the severest forms in the West Indies, especially in Cuba and Hayti, and prevails to a greater or less extent in Guadeloupe, Martinique, and Barbadoes. In Europe endemic dysentery occurs over limited areas only, and is present in the more southernly-placed countries. Thus it is known in Greece, but is endemic in the Ionian Islands and the Cyclades. In Turkey it is common, in Bulgaria and Roumania, along the Donau, also, while the southern provinces of Italy and Sicily are the most severely affected regions in Europe. France, Switzerland, Belgium, the Netherlands, and Great Britain are free from endemic dysentery. In Germany there are no definite foci of occurrence, but a number of cases of the disease have been observed at Weimar and Kiel. The same facts are true of Austria, which, in general, has escaped, although cases have been reported from Prague, Graz, and Vienna.

The distribution upon this continent, and especially in the United States, of the endemic form of dysentery is, at present, difficult to estimate. If we accept this variety as synonymous with tropical and amœbic dysentery, a much closer study of the disease than yet made will be necessary in defining the limits of its prevalence. Cases have been reported from Maryland, Massachusetts, Pennsylvania, Texas, Ohio, Alabama, and Georgia. But it seems probable that many of the so-called sporadic cases occurring in this country, and, perhaps, not a few of the epidemic ones, may be shown to be of this kind. With the exception of the investigations of the disease carried out in Egypt, Germany, Austria, and Italy, the American cases above referred to have been the most thoroughly studied.

The epidemic form of dysentery is oftenest confined to a single locality, a village or a town, with no extension to the country around. Instances are not rare in which the epidemic attacks a single detached establishment, such as a prison, a hospital, a poor-house, a soldiers' barracks, or, under certain circumstances, a ship, while there are no cases of dysentery outside these, or merely occasional cases (Hirsch). It happens much more rarely that the disease achieves a greater diffusion, and most rarely do pandemics arise. Mention has already been made of the prevalence of dysentery as an epidemic disease, especially in earlier historical times. Great epidemics have not appeared in recent years. The countries which have been most severely visited are Italy, France, Ireland, Denmark, and Norway and Sweden. In the United States, dysentery in an epidemic form, except during the War of the Rebellion, has not in late years reached serious proportions. According

to Woodward, it prevails annually among the civil populations in all parts of the United States. It occurs both in the form of sporadic cases and of small local epidemics which fasten upon different districts in different years.

Sporadic dysentery, which is distinguishable both from the endemic and the epidemic forms, is of very uncertain occurrence. This variety of dysentery is attributed by Kartulis to the action of mechanical and chemical irritants upon the intestine, and arises as a secondary condition in the course of other diseases, such as acute, infectious, and chronic diseases of the heart, kidneys, and liver. By most writers the occasional cases of dysentery met with in all countries are included under this term.

Various telluric conditions have, from time to time, been supposed to influence the prevalence of dysentery. Of late years the search has been made for micro-organisms to the action of which the disease might be attributed. With what success this line of investigation has been pursued will be stated in other parts of this article. It is a well-known fact, and one borne out by the best statistics, that both the epidemic and the endemic forms prevail especially during the hot seasons. Great diurnal variations of temperature—warm days and cold nights—have been supposed to predispose to the development of the disease, but in Egypt the facts observed are in direct opposition to this view. The degree of atmospheric moisture seems without influence: Hirsch states that, of 126 epidemics of dysentery, 65 occurred during moist weather and 61 during continued drought. The elevation and configuration of the surface seem also without particular significance, although low-lying and marshy localities are more subject to visitations than high and dry ones.

There is good reason to believe that the dissemination of the virus of dysentery takes place, in large part, through the water. And, although the same conclusive evidence of water-infection has not been brought for this disease as has been brought for cholera, yet there are many convincing observations at hand which bear out this belief. Numerous outbreaks both of the endemic and epidemic varieties, among troops and inhabitants of towns, have been traced directly to contaminated drinking-water; and the replacement of the polluted by a wholesome supply has been quickly followed by a cessation in the spread of the disease. Observations which indicated a more contagious character, a transmission from person to person, are not wanting. But whether, in these instances, the virus may not have been carried by water, wash-linen, or food is not certainly known.

The demonstration of parasitic organisms bearing an etiological relation to dysentery has been done certainly only for the endemic variety. Several different bacterial organisms have been described in association with the epidemic dysentery. The proof of their essential causal relationship with the disease has yet to be brought. The several micro-organisms will be considered with their respective diseases.

AMÆBIC DYSENTERY.—This affection is also known as endemic and tropical dysentery, and as *amæbic enteritis*. It is characterized clinically by irregular diarrhœa, a variable course often marked by periods of intermission and exacerbation, a special tendency to chronicity, and the development of liver-abscess, and anatomically by ulceration and thickening of the large intestine.

Morbid Anatomy and Etiology.—This form of dysentery has been known ana-

tomically for more than a century: since the writings of John Hunter, who observed the disease in Jamaica. The principal contributions upon its pathology has been made by Councilman and Lafleur, Kruse and Pasquale, Kartulis, Howard and Hoover, Flexner and Harris.

The lesions in the intestine are of two kinds: (1) a general catarrhal inflammation of the large gut, which does not differ from catarrhal colitis due to other causes; (2) the specific focal lesions (ulceration) caused by the presence in the tissues of the *amœba coli*. The specific lesions are located oftenest in the sigmoid flexure, somewhat less often in the cæcum and ascending colon, and more rarely in the descending and transverse colon and rectum (Kartulis). The vermiform appendix may be the seat of ulceration; most rarely does the dysenteric process pass beyond the ileo-cæcal valve and attack the lower end of the ileum.

The *amœbæ* are present upon the surface of the intestine and in the interior of the crypts, where by continued irritation they bring about destruction of the epithelium; they may then be observed to penetrate through the interglandular tissue into the depth. They set up an active inflammation in the mucosa, shown by the hyperæmia, ecchymosis, and swelling of the glandular epithelial cells. The farther extension of the *amœba* takes place after the partial destruction of the muscularis mucosæ. The organisms now reach the submucosa, where the principal damage is inflicted. The number of *amœbæ* in the submucosa is considerable; their presence excites a reactive inflammation, and soon a solution of the tissues in which lie. Thus a cavity is formed which, sooner or later, is followed by necrosis and removal of the overlying mucous membrane. When this happens, an

ulcer is the result. The lymphoid follicles are not especially attacked; they simply share the fate of the surrounding tissue. The muscular coat offers some resistance; it is not generally destroyed, but the *amœbæ* pass through it in certain places, enter the intermuscular tissue, and there repeat the part they play in the submucous tissue; the structures overlying the infiltration, deprived of their nourishment, undergo necrosis. The ulcers increase by this continual process of undermining; but the typical course and appearance of the ulcer may be completely changed through the action of the bacteria in the intestinal canal.

The ulcers are, for the most part, undermined. Often the defect in the mucous membrane is small and altogether inconsiderable, while the cavity in the submucosa and deeper tissues is large, and sinuous tracts, sometimes connecting several ulcers, are met with. Again, simple ulcers, with little or no undermining of the mucous membrane and limited to the submucosa, exist. Both forms may be associated. More rarely still, large sloughs, which may consist of the mucous or muscular coats, are encountered. The part of the intestine involved becomes much thickened, partly through the infiltration present in the submucous and other coats, and partly in virtue of a thickening of the peritoneal coat; adhesions between adjacent intestinal loops and deformation also occur. According to Councilman, fibrinous exudation upon the surface of the mucous membrane (diphtheritic or croupous membrane) does not take place in uncomplicated cases, while Kartulis describes its occurrence.

The *amœbæ* occur in greater or less numbers in intimate association with the ulcers and even in adjacent parts. They

are found in the tissue-spaces, within the crypts of Lieberkuhn, in definite lymphatic vessels, and in the veins.

The mere presence of amœbæ in the stools is not sufficient evidence of the existence of amœbic dysentery. As early as 1870 Lewis and Cunningham found amœbæ in the stools of persons sick of cholera in India. They have even been found in the stools of healthy persons (Grassi, Kruse and Pasquale, Mincke and Roos, Schuberg). Losch (in 1875) gave the first accurate account of the organism which he found in the stools of a dysenteric patient, and he studied the intestine removed at the autopsy. R. Koch observed amœbæ in sections of the intestine of a number of cases of dysentery occurring in Egypt and India, and suggested a causal relationship between them. Soon afterward (1885) Kartulis was able to find them in more than five hundred cases of endemic dysentery prevailing in Egypt, while they were absent in other diseases. Similar organisms were also found in the contents or walls of amœbic abscess of the liver. The results of Kartulis's studies have been abundantly confirmed in this country by Osler, Councilman, Lafleur, Simon, Dock, Eichberg, Howard, Musser, Stengel, Flexner, Wilson, Harris, and others.

The amœbæ coli (s. dysenteriae) resembles in many ways the amœbæ occurring in the stools of healthy beings. The average size of the latter is from 12 to 36 microns, of the former from 10 to 50 microns. The structure of the two forms is also similar. In a state of rest they appear as slightly-refractive and faintly-granular spheres; in the active state a separation into structureless ectoplasm or hyaloplasm and a more refractive, granular, endoplasm or granuloplasm takes place. The pseudopodia are extruded slowly and may be easily ob-

served; change of position does not always follow the extrusion. Nuclei are present and often visible, even in the fresh state. This description suffices for the non-dysenteric as well as for the dysenteric varieties; in the latter there is found, in addition, contained within the endoplasm, vacuoles, bacteria, and red blood-corpuscles. The chief constituent, from a diagnostic stand-point, is blood-corpuscles, as these never occur in the amœbæ found in healthy persons; both the vacuoles and bacteria may, however, be present. Nothing definite is known of the mode of propagation, but it is believed that multiplication takes place by division.

The amœbæ are very little resistant; the stools, etc., must, therefore, be examined soon after their evacuation. Their number quickly diminishes in material outside the body, and at the end of from six to twenty-four hours they are often no longer to be found. They have not been certainly successfully cultivated outside the body in a pure state, although they may have been cultivated along with other micro-organisms (Kartulis, Celli, and Fiocco).

The evidences for the belief in the causal relationship between the amœba coli and endemic dysentery is summed up by Kartulis as follows: "The constant presence of the organism in cases of endemic dysentery (with the exception of the so-called 'Cochin-China diarrhœa'; see below); its presence in the walls of the dysenteric ulcers and absence from other kinds of intestinal ulcers; the successful production of dysentery in cats by the injection of fæces containing amœbæ into the rectum and even of pus from liver-abscesses free from other micro-organisms; the negative results of similar injections (excepting in the experiments of Celli and Fiocco) of other

micro-organisms obtained from dysenteric stools; and, finally, the failure of healthy stools containing amœbæ to provoke dysenteric lesions in cats."

[The recognition of the amœbæ in sections of hardened tissues and their distinction from swelled and degenerated tissue-cells are not always easy. Mallory has introduced a special staining method in which thionin is used, and Harris employs toluidin-blue, in order to differentiate these organisms from other cells. SIMON FLEXNER.]

The amœba dysenteriae is distinct from the non-infectious form, or amœba coli. The former, when coupled with bacteria, is the cause of dysentery and of some liver-abscesses. There still remain other liver-abscesses which must be classed as idiopathic, and in which climatic conditions must be looked on as playing a large part. Among the many questions which are yet to be solved concerning the amœbæ are the following: Whether their virulence is constant or can be lost and acquired; how they gain access to the human body; how the bacteria aid them; where the bacteria come from; how the dysenteric ulcers begin; whether the predisposing causes of cold and indigestion work on the human organism or on the bacteria; whether there is not also a systemic infection, as well as a local process; in what way the amœbæ gain access to the liver, whether along the portal system, the lymphatics, the peritoneum, or the bile-passages. There are certain cases which point to each mode, but in multiple abscesses the propagation is along the blood-current, either from the ulcers or backward from an original single focus. Kruse and Pasquale (Zeit. f. Hygiene u. Infectiouskr., Feb. 8, '94).

Two cases of dysentery in which the pathogenic character of the amœbæ seemed to be undoubted. Besides the ordinary variety, there were encysted forms, which were most frequent after patients had had a course of calomel. Quincke and Roos (Berliner klin. Woch., No. 45, '93).

Amœbæ can be found in large quanti-

ties in the intestinal glands. Kruse (Deutsche med. Woch., Nos. 15, 16, '93).

The endemic dysentery of warm climates is probably generated by animal parasites, is not contagious, and is sometimes also found in temperate regions. The amœba seems to be the principal factor in its causation, and the pathological changes produced are most likely due, in part at least, to the bacteria developed *in situ* or transported there by the wandering amœbæ. The direct pathogenic action of these corpuscles has not yet been satisfactorily established. Wesener (Rivista Inter. d'Igiene, Sept., Oct., '92).

In an etiological study of 10 cases, in only 1 was the amœba found, and then in but small number; in the remainder the stools did not contain any microbes which could be assumed to be the cause. It is possible that microbes ordinarily present in the intestine, such as the colon bacillus, may take on a virulent property. Laveran (Le Bull. Méd., Nov. 8, '93).

There are three forms of the organism: (1) the *Amœba coli felis* (Losch), which is the true amœba of dysentery; (2) the *Amœba coli mitis*, the cause of the diarrhœa in the second case; and (3) the *Amœba coli vulgaris*, the form observed in healthy persons. Calomel in small doses appeared to be the best method of reducing the number of amœbæ in the stools. Quincke and Roos (Berliner klin. Woch., No. 45, '93).

Chronic-dysentery amœbæ are not pathogenic to cats except when the intestinal mucous membrane has been injured, as by a sublimate solution. The amœbæ are not the cause of dysentery, but irritants which prevent the healing process in lesions already existing. Kovac (Zeit. f. Heilkunde, B. 13, H. 6, '94).

Inclination to question the importance of the amœba as the chief cause of dysentery. That it is only partly responsible seems confirmed by personal investigations in 153 cases of dysentery, in which the bacillus coli and bacillus pyocyaneus seemed to play a more important rôle. The amœba coli was present in nearly half of the acute cases and in 13 out of 34 chronic cases, but there was no rela-

tion between the numbers present and the severity of the case. In the stools of perfectly-healthy individuals, amœbæ found in considerable numbers in 20 per cent. The ulceration produced in the colon of a cat by injecting into it dysenteric fæces, also produced by injecting sterile vegetable *débris*. Grasser (Archives de Méd. Exper., Mar., '95).

The protozoa are of very secondary importance in the etiology of dysentery. On the other hand, the bacterium coli is constantly present, often in pure culture, at other times associated with the pseudotyphoid bacillus. Attention called to a variety of the bacterium coli which produces a toxin capable of producing experimentally the lesions of dysentery, when administered by the mouth, rectum, or subcutaneously. A. Celli and R. Fiocca (Centralb. f. Bak. u. Parasit., Mar. 15, '95).

Biological and clinical study of 235 cases of diarrhœa and dysentery. The amœba found 86 times, most frequently in cases of typical diarrhœa, less often in simple catarrhal enteritis, and least frequently in sporadic dysentery, whether mild or fatal. The pathogenic importance of the amœba denied, experiments upon cats having shown that the amœba swallowed up numerous microbes, and that, where amœbæ were numerous, but a small number of microbes were met with. Opinion expressed that the amœba prevents the development of bacteria and permits healing of the lesions, thus explaining the vegetating form of the ulcerations observed by Councilman and Lafleur. The amœba prevents an acute evolution of the process, which, in turn, explains why amœbic dysentery is of a chronic type, as assumed by many authors. Cassagrande and Barbaglio-Rapisardi (Gaz. degli Osp., No. 66, '95).

Micro-organism found in the fæces, in the wall of the large intestine, mesenteric glands, and spleen. A bacillus with rounded ends, slightly swelled; it develops rapidly in gelatin and other culture-media at an ordinary temperature; under cultivation its transverse diameter increases; it has very little movement, and is slightly colored by aniline. In sterilized Seine water it grew rapidly.

Guinea-pigs fed with the pure culture show no effect for a few days. If killed in eight days, the stomach is ulcerated; the mucous membrane of the large intestine is swelled, ecchymosed, ulcerated, and the closed follicles are hypertrophied, as well as the mesenteric glands; between the tubular glands a large number of bacilli are seen penetrating and forming groups in the submucous tissue. The liver shows yellowish foci, and in the centre of the portal spaces and in adjacent capillaries are bacilli like those which had been injected. Intraperitoneal injections of the bacillus produced death in two or three days, due to peritonitis, pericarditis, and fibrinous pleurisy.

The presence of this bacillus in the stools and viscera of dysenteric patients, its absence from the stools of healthy individuals, and the lesions which it seemed to cause in the organs of the guinea-pig are arguments in favor of the bacillary origin of the disease. Chantemesse and Widai (Gaz. Méd. de Paris, Apr. 21, '88).

In sixty cases of acute dysentery the colon bacillus found constantly present. Dysentery experimentally produced with these on dogs, clinically and pathologically. Arnaud (Le Bull. Méd., Mar. 21, '92).

Epidemic in the vicinity of Lake Maggiore in which the liquid stools were found to contain a special diplococcus, which, injected into animals, caused a characteristic diarrhœa. De Silvestri (Riforma Medica, No. 292, '94).

Complications.—Involvement of the peritoneum in the chronic cases with deformation of the intestine has already been mentioned; through the formation of adhesions definite kinking of the bowel may result. Perforation of the bowel, leading to peritonitis, is a relatively-rare complication, and peritonitis without previous perforation apparently still rarer. Small hæmorrhages in the intestinal mucosa, in the region of the ulcers, are frequent, but large hæmorrhages seem uncommon. In one of Coun-

cilman and Lafleur's cases about one hundred and twenty-five cubic centimetres of clotted blood were passed per rectum on the last day of illness. By far the most important complications are abscess of the liver and of the liver and lung. A very important, but unusual, sequel of liver-abscess is perforation of the inferior vena cava. Flexner has described two such cases. Although the data at hand for computing the frequency of amœbic abscess of the liver in endemic dysentery are, as yet, too few to admit of definite conclusions, yet, according to Kartulis (based on observation of 500 cases of liver-abscess), 55 to 60 per cent. were of dysenteric origin; Councilman and Lafleur found liver-abscess 6 times in 15 cases, Kruse and Pasquale 6 times in 57 cases of amœbic dysentery. Kartulis states that liver-abscess, which is so common a complication of endemic dysentery, is infrequent in the epidemic form. Hence the statistics of British and French physicians covering this subject, in which the proportion of 1 case of liver-abscess for every 4 or 5 of dysentery occurring in the East, probably relate chiefly to the amœbic form.

Hepato-pulmonary abscess occurred four times in Councilman and Lafleur's cases. Following pulmonary abscess, pleurisy and pyothorax or pyopneumothorax (Flexner) may supervene. The amœbæ were found in the contents of the hepatic and pulmonary abscesses and pyothorax. In abscess of the lung the organism appears in the sputa. Kartulis has encountered abscess of the brain and spleen in amœbic dysentery; in neither situation was he able to demonstrate amœbæ.

The question of the existence of amœbic hepatic abscess without evidence of previous intestinal lesions is still an open one. Kruse and Pasquale mention

two cases, but admit that they are not conclusive. Flexner has described an undoubted case. The etiology of the so-called idiopathic, or tropical, liver-abscess is still wrapped in obscurity.

Results of examination in a case of abscess of the liver following dysentery in which the amœba was found in the pus drained from the abscess. The amœbæ from the abscess were somewhat larger than those described by Kartulis; they were circular, sometimes ovoid, but while in movement had an irregular outline. The alterations in contour and change in locality were as remarkable as in some forms of pond amœbæ. Motion continued active for hours; in two instances for ten hours. In the stools the amœbæ were rare in the brownish liquid; more frequent in the small sloughs passed. In form and other characters they were like the organisms in the pus from the liver-abscess. Osler (Johns Hopkins Hosp. Bull., vol. i, No. 5).

Case illustrating the association of symptoms clearly demonstrating the existence of amœbic dysentery with hepatic abscess. Upon opening the latter a pint of the typical chocolate-colored pus was evacuated. Musser and de Forrest Willard (Univ. Med. Mag., Apr., '93).

Liver-abscess does not necessarily presuppose an attack of dysentery. Seven cases in which there was no history of dysentery; two had never been ill before. In the three fatal cases there was no sign of recent or remote dysentery. Rennie (Brit. Med. Jour., Aug. 25, '94).

Statistics showing that suppurative hepatitis is almost always the consequence of dysentery; there is but a single pathogenic element concerned in the production of both diseases. Proof: if dysenteric fæces containing living amœbæ be injected into the rectum of cats typical dysentery will be produced, the animals dying usually in from thirty-nine hours to nine days, though some may survive and even recover; 7 out of 11 of those injected showed amœbæ in the evacuations. The classical alterations of dysentery were found at autopsy. Zancarol (Le Progrès Méd., June 15, '95).

COCHIN-CHINA DIARRHŒA. — This is a form of dysentery which occurs in Cochin-China and some other tropical countries. Normand in 1876 found, in the stools of soldiers who returned from Cochin-China to Toulon and who were suffering from chronic diarrhœa, two forms of nematodes (*Anguillula stercoralis* and *Anguillula intestinalis*) afterward shown by Leuckhart to be the successive generations of a single species to which he gave the name *Rhabdonema strongyloides*. Further studies have rendered doubtful its etiological relation to the disease. The parasite is often absent at the beginning of the affection, while it is not infrequently found in the stools of healthy persons. Calmette has studied more recently this form of enterocolitis, and has made it probable that the bacillus pyocyaneus, alone or in association with the streptococcus, is the cause of many cases. He also demonstrated the bacillus pyocyaneus in the drinking-water at Saigon and Gokong. Calmette was able to produce hæmorrhages and ulceration of the stomach and intestine in rabbits by injection of cultures of the bacillus pyocyaneus. L. F. Barker has reported several cases, from the Johns Hopkins Hospital, of enteric infection and inflammation caused by this bacillus. In one instance an extensive diphtheritic inflammation of the œsophagus, stomach, and intestine existed. As a cause of diarrhœa and dysentery in infants it has been met with by Adami and Williams in Canada, and of an epidemic of the same diseases in Albany, N. Y., by Blumer and Lartigan.

The combination of the colon bacillus and the proteus bacillus is the essential cause. In northern Europe the epidemic is decidedly different from those seen in tropical climates. Chaltin (Archives Méd. Belges, Apr., '94).

In the case of Europeans, a large number of species of micro-organisms found, among which are the colon bacillus and an amœba. In natives (Cochin-Chinese) the number of species is less numerous, probably as a result of the more simple and almost entirely vegetable diet. Two species regarded as important found: a coccus having all the properties of the streptococcus erysipclatus and the bacillus pyocyaneus. A Calmette (Archives de Méd. Navale, Sept., '93).

CATARRHAL DYSENTERY. — This is a disease of the intestines, affecting principally the large bowel, which occurs sporadically or epidemically. It is the form of dysentery met with most frequently in temperate climates.

Morbid Anatomy and Etiology. — The area of intestine involved may be large or small; sometimes the affection is limited to a circumscribed area or areas, at others the mucosa in its entire extent is involved, even including the stomach. The colon is most often the seat of the lesions. Woodward questioned the existence of an isolated affection of the small intestine, while Nothnagel claims to have met with cases in which the pathological process stopped abruptly at the ileo-cæcal valve, the large gut having entirely escaped. The general mucosa and the solitary lymphoid nodules, especially, are affected. In the acute stage the affected part of the mucous membrane is reddened, especially about the lymphoid nodules and plaques, and small extravasations of blood may appear. There is an excessive production of mucus and a rich desquamation of epithelial cells. The villi and solitary nodules are swelled, the latter becoming unduly prominent. The microscopical picture agrees with the macroscopical appearances: there is hyperæmia, swelling, and desquamation of epithelial elements and round-celled infiltrations of the mucosa. The swelled lymphoid nodules show an

increase in cells, the chief ones being of the large epithelioid variety occupying the germinal centres. Extravasations of blood are present in the mucosa about the nodules. The submucosa shows changes only in the severest grades. In more protracted cases ulceration, limited to the nodules or extending into the adjacent mucosa, appear. The chronic cases are characterized by pallor of the general mucous membrane; pigmented spots appear, and at one time the mucous membrane is atrophic, at another hypertrophic. In the latter instance, in the most marked cases, a polypoid condition of the affected mucous membrane may exist.

The causes of this disease are twofold, namely: agents of (A) intoxication and of (B) infection. (A) All caustic chemical agents which act directly upon the mucous membrane (acids, alkalies, etc.) and others brought by the blood and eliminated by the intestine (mercury, ricin, etc.) and the more indefinite chemical substances which are found, under some circumstances, in the ingested food. (B) Bacteria play an important rôle in the causation of this disease. Booker's study of the summer diarrhoeas of children is most convincing in this respect. "No single micro-organism is found to be the specific exciter of the summer diarrhoea of infants, but the affection is generally to be attributed to the result of the activity of a number of varieties of bacteria, some of which belong to well-known species and are of ordinary occurrence and wide distribution, the most important being the streptococcus and proteus vulgaris." As to the mode of entrance into the mucosa, Booker says: "In the superficial epithelium of the intestine is apparently to be found the chief protection of the mucosa against the invasion of bacteria. When

the epithelium is preserved, bacteria are not found in the mucosa beneath, whereas they may be seen entering it in places where the epithelium has been lost or injured." Gärtner's bacillus enteriditis is capable of provoking acute enteritis; and acute enterocolitis is associated as a secondary affection, with a variety of specific infections (cholera, typhoid fever, tuberculosis), intestinal diseases, and other infectious processes (sepsis, influenza, pneumonia, scarlet fever, measles, diphtheria, etc.).

Report on epidemic of dysentery at Toulon. From May 20th to November 1st there were 212 cases: in May, 1; June, 6; July, 57; August, 62; September, 53; October, 20. The conditions which accompanied this outbreak were a high temperature in the last of July and August, 91.4° F., and even 95° F., and lower temperature in September and October; moderate rain-fall; the soil contained various micro-organisms, exposure to the foul air of a sewer conveying faecal matter and found to contain micrococci and bacilli; the potable water was pure; there was chilling of the patient in 37 cases; excessive fatigue in others. Several of the cases were convalescents from typhoid fever and from tropical dysentery. The staphylococcus pyogenes albus or aureus found to be a constant element in the stools of severe cases. Experiments with the cultivated germ failed to produce any effect when introduced into the caecum of a rabbit or when swallowed by a dog. The absence of fever noted in cases of each variety, mild and severe. Bertrand (Archives de Méd. Navale, May to Nov., '88).

Epidemic of dysentery which attacked the garrison at Poitiers in 1892. Very unhygienic conditions. The soil was most at fault, having been impregnated by faecal matter; the water was also certainly impure. A number of instances prove the contagiousness of the affection, either direct or indirect; the latter through the faecal matter drying and being spread about in the form of dust.

Prieur (Jour. Cut. and Genito-Urin. Dis., Mar., '94).

Epidemic of dysentery in the garrisons of Antwerp and Brasschaet during the summer of 1893: 324 cases, 18 ending fatally. In the cases that recovered, the appetite for solid food returned long before the stools lost their dysenteric character; the food was apparently well borne. The drinking-water was the probable source of infection. Cases of transmission by contagion seemed clear. Spruyt (Archives Méd. Belges, Apr., '94).

Epidemic on ship *Arabia* between Calcutta and Demerara. The ship leaking badly, the decks, both upper and lower, were wet day and night, where the passengers (natives) slept. The largest number of cases in any week occurred when the mean night-temperature was the lowest: 66° F. on the upper deck and 78° F. below. Out of 404 persons, 56 were ill. Three deaths occurred from dysentery and one from empyema. Pearce (Provincial Med. Jour., Oct. 1, '90).

Microbes constantly present in the intestine may become pathogenic when the state of the mucous membrane is altered by sudden changes in temperature. Maurel (Le Midi Médical, May 6, '94).

History of an epidemic of dysentery and of diarrhoea among the soldiers quartered at St. Stephen's in 1892. The main factors were contagion from water-closets and a warm, damp summer, with sudden changes of temperature. Olivier (Archives de Méd. et de Pharm. Mil., June 1, '94).

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Outbreak of acute dysentery in five members of a family with two deaths. The features of the disease were almost identical in all. Finny (Brit. Med. Jour., Apr. 11, '96).

DIPHThERITIC DYSENTERY.—An inflammatory disease of variable and uncertain etiology, which affects especially the large intestine, sometimes involving the small gut, which may or may not be attended with fever; is characterized by mucous, serous, or bloody stools, and is

accompanied with tormina and tenesmus. The anatomical lesions consist of necrosis of the mucous membrane, the deposit within its substance and upon its surface of a fibrinous pseudomembrane, and the formation of ulcers. This occurs (*a*) as a primary disease, in which form it probably gives rise to the great majority of the cases of epidemic dysentery; (*b*) as a secondary and terminal affection in many acute and chronic diseases, the chief ones being acute general infections and chronic renal, cardiac, and hepatic disease. Certain cases of *sporadic dysentery*, the result of the action of chemicals and metastatic bacteria upon the intestinal mucous membrane and indirectly of mechanical irritants (coprostasis, intestinal worms), belong to this class.

Morbid Anatomy and Etiology.—The pathological process begins with hyperæmia and swelling of the submucosa and mucosa. The unique character of the disease begins with the appearance of small grayish-white membranous patches upon the surface of the mucous membrane. These increase in size and become confluent. At first they are readily removed with the finger; at a later stage they are more adherent. They tend to appear, by preference, upon the more prominent and projecting parts of the mucosa; thus, in the small intestine along the tips of the valvulæ conniventes; in the large, corresponding with the insertion of the longitudinal muscular bands. At a later time and in severe cases the intervening mucous membrane may become covered. Upon microscopical examination, in the earliest stages of the disease the blood-vessels of the submucous and mucous coats are congested and contain an increased number of polymorphonuclear leucocytes; the superficial epithelial layer is necrotic, and fibrin and leucocytes are present on the injured surface.

Somewhat later the necrosis has extended and involved the deeper parts—glands and interglandular tissue—and the fibrinous membrane is thicker and intimately bound up with the necrotic tissue. Many kinds of bacteria are present in the necrotic and exudative material. The swelling of the submucosa may reach a high degree, due to œdema, cellular infiltration, and a deposit of fibrin. The blood-vessels of the mucous membrane become plugged by hyaline thrombi. The separation of the dead tissue leaves an ulcer behind. The young ulcers do not extend deeper than the submucosa coat; later, and by continued destruction, the muscular coat may be exposed. Perforation of the intestines is, in this form of dysentery, unusual. Ecchymoses occur in the neighboring mucosa. Even the deepest ulcer may, through the formation of granulation-tissue, heal. In these cases the wall of the intestine becomes thickened; the muscle hypertrophic; the scars have a pigmented appearance, and, through retraction of the cicatricial tissue, deformity and often stenosis of the bowel arise.

The points of predilection of the pathological process are the flexures (sigmoid, splenic, hepatic), the ascending colon, and cæcum. In the Crimean War the rectum, sigmoid flexure, and descending colon were the principal points of attack. The small intestine is only rarely affected in its lowest parts, and this in severe cases; in certain secondary forms of dysentery it may be attacked alone.

Klebs was the first to describe short bacilli in the crypts of Lieberkuhn in diphtheritic dysentery. Since this time a large number of bacteria have been described in association with the disease. None of these appear to be specific, and the circumstances of the disease make it

easy to isolate different bacterial forms. From what has already been said it is not probable that diphtheritic dysentery is caused by a single micro-organism. As regards the question of etiology of epidemics, whether in a given epidemic a single species of micro-organism is to be regarded as the cause, and in different and widely-removed ones the same species will be found, cannot be answered at present. Thus far a very small number of epidemics have been studied with modern bacteriological methods.

Ziegler described small bacilli in the crypts of Lieberkuhn and the underlying mucous membrane. Marfan and Lion cultivated from the mesenteric glands, pericardial fluid, and heart's blood of two cases the *bacillus coli communis*. Babès has cultivated the streptococcus, proteus vulgaris, and other organisms from dysenteric cases. Maggiori studied, in 1891, an epidemic which occurred in Italy. He found in the mucous stools of all cases the *bacillus coli communis*, in association with proteus vulgaris. More rarely pyococci, *bacillus fluorescens*, and pyocyaneus were obtained. Ogata investigated an epidemic which prevailed in Japan. He found small bacilli, which lay in the protoplasm of cells; they were present in the base of the ulcers. Cultures from fifteen cases gave a short, non-pathogenic, liquefying bacillus. From eleven cases Ogata cultivated a bacillus which also liquefied gelatin, but was pathogenic. Guinea-pigs, inoculated subcutaneously, develop hæmorrhages and ulcers in the intestine. Rectal injections produced more pronounced results. Condorelli, Maugieri and Aradas describe a bacillus which they obtained from an epidemic and also isolated from the drinking-water; Bertrand and Baucher studied an epidemic at Cherbourg and isolated several different

bacteria, none of which appear to be specific. Silvestri described diplococci which caused diarrhoea in dogs. Colli and Fiocco found that in the dejections of dysenteric persons the bacillus coli communis is always present; with it is often associated a typhoid-like bacillus; more rarely the streptococcus and proteus bacillus. The introduction of this bacillus coli, either alone or in association with the other bacteria, by means of the mouth or rectum, into cats, gives rise to dysentery. According to these writers, the association of the bacillus coli communis with the other bacteria mentioned leads to its conversion into the bacillus coli dysenterie. Celli has more recently expressed the idea that the primary injury to the intestine is produced by the toxin of the bacillus dysenterie, which is followed by the injurious action of pyogenic cocci contained within the intestine. Ciechanowski and Norrak have failed to confirm this view by experiments, although they found large numbers of streptococci in the stools of cases of sporadic dysentery. The bacillus pyocyaneus, according to Blumer and Lartigau, may be associated with epidemics of dysentery in this country.

Treatment.—The hygienic rules which are observed in the prevention of other infectious diseases and especially of cholera have been employed with excellent effect in controlling epidemics of dysentery. The employment of filtered and boiled water has reduced the numbers of cases and the spread of the disease in the tropics. The same principles are applicable to the treatment of articles of food (vegetables, fruits, etc.) which come into contact with water. Other prophylactic measures consist in the use of suitable clothing which obviates the injurious influence of rapid changes in temperature and humidity of the air and

the proper disposition of the dejecta from the sick.

The direct treatment is, in part, dietetic, in part therapeutic. In acute cases the diet is to be restricted to milk, whey, and broths, and during convalescence great care is to be exercised in providing only the most digestible articles of food. In the use of a diet of milk, which often will be the chief article, the appearance of curds in the stools is the indication to dilute or partially peptonize the milk before it is administered. Diluted egg-albumin may supplement milk or even take its place for a few days if there is much intolerance to the latter. Sometimes milk is made more acceptable by dilution with lime or Vichy water. The quantity of milk, for an adult, administered in twenty-four hours should be from 2 to 2½ quarts. Whatever the food, it is advisable to give it in small quantities and at frequent intervals.

The patient even in chronic cases should be confined to bed; in acute cases no especial persuasion will be required. For the relief of the abdominal pain, the external application of fomentations or turpentine stupes will sometimes suffice; but the internal use of opiates may be demanded. When the pain is low down in the bowel then enemata of opium or suppositories containing some form of this drug or of cocaine may be resorted to.

When a case is seen early, especially if there has been constipation, a purge should be administered. This can be either castor-oil or, what is preferable, a saline. By this means the fecal contents of the large intestine, which tend to pass continuously over the inflamed area, should be effectually removed. The saline selected should be given in sufficient doses to promptly produce abundant dejections, and it is then to be dis-

continued. There may be a marked diminution in the frequency of the dysenteric evacuations, and great relief of the tormina and tenesmus following the operations of the purgative. The use of a saline is contra-indicated by feebleness of the patient; in such cases castor-oil is to be preferred.

Ninety-five cases treated at Hyderabad, India, by sulphate-of-magnesium method. The number of days under this treatment before the dysenteric symptoms disappeared was never more than 5, and in many cases 1 or 2 only. Leahy (Lancet, Oct. 4, '90).

[Saturated solutions of magnesium sulphate urged by many observers: To an ounce of saturated solution of magnesium sulphate 10 drops of dilute sulphuric acid are added; this is given every hour or two until it operates freely and the stools have become feculent, free from blood and mucus, and the pain and tenesmus are relieved. W. W. JOHNSTON, Assoc. Ed., Annual, '91.]

Mortality reduced from 5 to 10 per cent. to practically *nil*, by avoiding all irritants and stimulants; rendering the intestinal canal aseptic by preventing the decomposition of contents: by counteracting acidity of the blood by alkalies and thus quieting the abnormal action of the intestinal glands. Diet restricted to arrowroot-milk and trinitrate of bismuth, Dover's powder, and soda internally. Bahadurji (Brit. Med. Jour., Oct. 24, '91).

Literature of '96-'97-'98.

Drachm-doses of a saturated solution of Epsom salts, in combination with 10 minims of dilute sulphuric acid, every hour, are strikingly effective. V. G. Thorpe (Brit. Med. Jour., Feb. 26, '98).

Among the drugs used to combat the disease, ipecacuanha still maintains its reputation in the tropics. It is usually administered after a preliminary dose of laudanum or morphine, which is followed in half an hour by from 20 to 60 grains of

ipecacuanha. Should the dose be rejected, it is repeated in a few hours. This mode of treatment was not satisfactory during the War of the Rebellion, and Osler has failed to see in sporadic cases the marked effects claimed for it by the physicians in the tropics.

[Fluid extract of ipecacuanha, 30 to 50 drops in 2 or 3 drachms of water, every 6, 12, or 24 hours, combined with tincture of opium if not retained, is an excellent method of administering this specific remedy. W. W. JOHNSTON, Assoc. Ed., Annual, '89.]

The use of ipecacuanha powder which has been deprived of emetine advocated. The ipecacuanhic acid is at first abstracted, but subsequently remixed with the powder after the emetine has been removed. Patients thus escape the nausea and prostration of powdered ipecacuanha. Harris (Lancet, Aug. 30, '90).

Epidemic on ship *Arabia*, 56 cases, 4 deaths. All treated with ipecac; 20 to 30 grains at the first onset, and in one hour 10 to 20 grains; in another hour 10 grains. Hot-water fomentations were kept over the abdomen. Vomiting rare. Pearce (Provincial Med. Jour., Oct. 1, '90).

Ipecac, though valuable, is inferior to bismuth and Dover's powder. Crombie (Indian Med. Gaz., No. 4, '93).

Epidemic of dysentery in Alquizar, Cuba; 137 cases under treatment. The mortality among those treated with ipecacuanha and calomel, opium, etc., amounted to 9 per cent., while that among those treated by benzonaphthol was slightly above 2 per cent. Forty-five grains per diem were given to adults and but little less to children. Jose A. Clark (Lancet, July 20, '95).

Literature of '95-'97-'98.

Ipecacuanha and saline purgatives are suitable principally for chronic cases in which malaria has much to do with the condition. Epidemic in a garrison in which the local treatment consisted in warm creasote enemata, made with milk, prepared as follows:—

R Beech-wood creasote, 15 grains.
Tincture opium, 10 drops.
Boiled milk, 5 drachms.

The contents of the bottle poured into a jar containing 7 ounces of boiled water for one enema.

Three such enemata to be administered in the twenty-four hours.

Before having recourse to these enemata, the rectum should be thoroughly washed out with boric-acid solution containing also salicylic acid. Testevin (*Med. Week.*, p. 252, '96).

Experience in Bengal has given great faith in ipecacuanha in large doses. Castor-oil should be given the night before and, after the bowels have moved in the early morning, tincture of opium, followed in fifteen or twenty minutes by ipecacuanha in a dose of 25 or 30 grains. The patient should lie undisturbed for four or five hours. Should vomiting occur, ipecacuanha to be repeated in half an hour and also if the stool has not much changed for the better within twenty-four hours. Ipecacuanha in pill, in doses of from 3 to 5 grains, is utterly useless. W. J. Buchanan (*Practitioner*, Dec., '97).

Ipecacuanha tried several years in Nicaragua, Central America. Notwithstanding its vaunted efficacy, no case derived much benefit from it. Patients suffering from dysentery cannot always retain large doses, as stated in textbooks. Half-ounce doses of a saturated solution of magnesium sulphate and 15 minims of dilute sulphuric acid every two hours, with milk diet, caused all traces of blood to disappear from the stools in twenty-four hours, and there was, of course, a complete absence of the distressing nausea which is always present in the treatment of ipecacuanha. T. R. Wigglesworth (*Brit. Med. Jour.*, Feb. 26, '98).

Corrosive sublimate, in doses of $\frac{1}{100}$ grain, repeated every two hours, has been recommended by Ringer. Bismuth in large doses— $\frac{1}{2}$ to 1 drachm every 2 hours, amounting to 12 to 15 drachms in 24 hours—often has a beneficial effect.

Its effects are more pronounced in the chronic than in the acute cases.

The administration of antiseptic substances by the mouth for the purpose of disinfecting the intestinal canal has been employed. For this purpose benzonaphthol is the drug to be chosen when there is suspicion of liver or kidney disease, and in their absence it is as effective as betanaphthol and resorcin, which are also employed as intestinal antiseptics. The dose of benzonaphthol is 40 to 80 grains, given during 24 hours, in divided doses every 2, 3, or 4 hours. Betanaphthol and resorcin are given in quantities of from 30 to 50 grains in 24 hours in much the same way. The naphthol preparations, being insoluble, must be given in capsules or dissolved in oil and emulsified. Resorcin is soluble and can be readily administered. Naphthalin (20 grains per day) and salol (30 to 40 grains per day) are used for the same purpose. Opium is an invaluable remedy for the relief of pain and to quiet the peristalsis, but should be employed cautiously. It is to be administered hypodermically in the form of morphine, according to the needs of the patient.

Irrigation of the bowel is both rational and useful. To overcome the extreme irritability of the rectum in the acute cases a suppository or solution (4 per cent.) of cocaine should be introduced as a preliminary measure. The irrigation is made with the long rectal tube, the patient being in the dorsal position, with a pillow under the hips. The substance to be injected is water at 100° alone or containing some astringent drug: alum, acetate of lead, sulphate of zinc or copper, nitrate of silver, or tannin. Tannin, in 0.5 per cent. solution, is highly recommended by Kartulis, who also uses this drug in combating amœbic dysentery. Osler regards nitrate of sil-

ver as the best, although not in the very acute cases. In the chronic form it is, perhaps, the most satisfactory treatment. The solution, in this class of cases, is to be made 20 to 30 grains to the pint, and, if possible, 3 to 6 pints of fluid are injected. At times the irrigation causes much pain and is immediately rejected.

Large enemata of hot water or ice-cold water relieve tenesmus and diminish the number of stools. An enema of 2 or 3 pints of water, with $\frac{1}{2}$ to 1 drachm of alum to the pint, once in twenty-four hours, through a soft-rubber tube, introduced one foot into the bowel, gives comfort for the next twelve hours. Editorial (Ther. Gaz., Oct. 15, '88).

Use of large and frequently-repeated rectal enemata. The patient should lie on the right side and 1 to 4 pints of water, at a temperature of 100° to 105° F., should be thrown into the bowel with an alpha syringe. Fairbairn (Brooklyn Med. Jour., Oct., '90).

Nitrate of silver recommended in acute dysentery. Complete cure obtained in six days. The rectum is first washed out with tepid water, and one hour later 5 ounces of a 2-grain-to-the-ounce solution of the silver salt is injected. Nilkanthrai Dayabhai (Indian Med. Rec., Mar. 16, '93).

For destroying the organisms and stimulating the ulcers, solutions of quinine, creolin, and silver nitrate tried; the latter gave the best results. West (Med. Record, Sept. 23, '93).

Literature of '96-'97-'98.

Two severe cases in which 1-per-cent. solutions of creolin used, with excellent results, in severe dysentery. A pint and a half of the solution was used night and morning. Creolin is worthy of an extended trial in dysentery. George Johnston (Treatment, June 24, '97).

Iodized starch internally tried in more than a hundred cases, giving a mixture of equal parts of iodized starch, oil of cinnamon, and oil of fennel, about 1 grain four times a day. At the same time irrigations with a solution of iodized starch to which are added a few drops of

chloroform, tincture of iodine, and oil of cinnamon given. Kotschorowsky (Semaine Méd., No. 62, '96).

Antipyrine used in a case of severe acute dysentery, by rectal injection three times a day of a solution of 75 grains dissolved in $\frac{1}{2}$ pint of water. Sedative action of the antipyrine greatly alleviated the patient, who gained strength and soon recovered. Ardin-Delteil (Bull. Gén. de Thér., Jan. 30, '98).

In amœbic dysentery the use of quinine irrigations was introduced by Losch, who found that solutions of 1 to 5000 destroyed the organisms. Stronger solutions—1 to 2500, 1 to 1000, and 1 to 500—are borne well and may be injected three or four times a day. Corrosive sublimate in solution of 1 to 500 or 1 to 3000, and nitrate of silver, 30 grains to the quart, are also beneficial, but must be used more cautiously. II. F. Harris has seen benefit result from the use of hydrogen peroxide in some cases. The ordinary commercial hydrogen peroxide is diluted from four to eight times with water and about a quart injected twice daily. The treatment is continued for one week and then the quantity gradually diminished.

Fifty-four cases treated by enemata of corrosive sublimate, 1 to 5000, of which 6 ounces were injected three times a day; later on a solution of 1 to 3000 was injected twice daily. The fluid was not retained usually longer than ten minutes. Cases cured in from 1 to 3 days. In no case was there any sign of systemic poisoning. Lemoine (Bull. Gén. de Thér., Jan. 30, '90).

For any of these measures to be effective in amœbic cases, they must be continued until the amœbæ disappear. In order to decide this an intermission of a couple of days is made in the treatment. If at the end of this time amœbæ are still present the procedures must be renewed. In the gangrenous cases little

good can be looked for from the injections, and, indeed, they are not without danger of precipitating a fatal termination by causing perforation of the already-much-injured intestine.

When tenesmus is slight an enema of thin starch containing $\frac{1}{2}$ to 1 drachm of laudanum affords great relief; for the more severe tormina and tenesmus the hypodermic injection of morphine is the only satisfactory remedy.

During the period of convalescence tonics containing some form of iron and a nourishing, but unirritating, diet are to be ordered. The recuperation of the patient's strength is to be facilitated by these and other well-known means.

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DYSMENORRHŒA. — Gr., *δυσ*, difficult; *μηνιαία*, menses; and *ρῆν*, to flow.

Definition.—Dysmenorrhœa is not a disease, it is only a symptom. The term has often been used in a very loose way to signify any or all the painful or other disagreeable sensations which may be associated with the abnormal performance of the function of menstruation. The headaches, the pains in the joints and muscles, the backaches, the nausea and vomiting which are of such frequent occurrence at the menstrual epoch do not constitute dysmenorrhœa, though they are doubtless influenced by the same cause which produces dysmenorrhœa. This symptom must be referred to the pelvic organs, to their nervous system, and to their vascular system; in other words, dysmenorrhœa is pain in the pelvic organs which is experienced in connection with the function of menstruation. It is a symptom of a pathological condition. A woman who is in perfect physical condition menstruates without pain.

Dysmenorrhœa may, therefore, be defined as a deviation from normal menstruation, menstruation meaning essentially a monthly congestion of the vascular system of the pelvis in obedience to a recurring impulse, with the shedding of more or less of the endometrium and the discharge of glandular secretions, the tension of the vascular system being relieved by the discharge through the uterine canal of a greater or smaller quantity of blood.

Symptoms.—The pain of dysmenorrhœa differs as to the time of its occurrence, its intensity, its duration, and the conditions which produce it. It occurs most frequently during the day or the two or three days which precede the menstrual flow.

Literature of '96-'97-'98.

In ovarian dysmenorrhœa, usually within twenty-four to forty-eight hours before flow appears the patient is seized with sharp, darting pains in one or both ovarian regions, generally the left. This pain remains constant or increases, until finally a show of blood takes place. The pain is not in the median line, but on either side, and in this respect the pain differs from that due to a uterine cause. Mundé (Med. Brief, May, '96).

With many women the beginning of the flow means the relief of tension and the relief also of pain; with others it continues, sometimes diminishing, sometimes retaining its acuteness until the pelvic congestion has subsided.

Literature of '96-'97-'98.

There are two conditions present in antelexion which are responsible for the pain. One is the swelling of the uterine mucosa which accompanies the flow, the other the condition of abnormal sensitiveness at the internal os. The tissues at the os internum are apt to be more rigid than normal and the nerves in an extremely-hyperæsthetic state. The in-

creased congestion which accompanies the onset of menstruation and the tension of the tissues generally irritate the nerves and aggravate the pain. This is the case during the first few hours of the flow. Later the tissues become relaxed, and the canal, to a certain extent, straightened, and the pain disappears. After a time varying from twelve to twenty-four hours relaxation has occurred, the flow is more profuse, and the pain has largely ceased. Davenport (Bos. Med. and Surg. Jour., June 2, '98).

In intensity it may be a simple ache, a feeling of distension within the pelvis, or it may be an acute, continuous, neuralgia-like sensation. It is often spasmodic in character, with a feeling of contraction or bearing down in the uterus, and may be relieved when a clot or gush of blood is ejected from the uterine cavity. The acuteness of the pain is also governed by the temperament of the patient, a highly-organized sensitive person suffering more than a phlegmatic, insensitive one. It is more frequently experienced in damp than in dry weather, at the sea-shore rather than at the mountains, during an ocean-voyage rather than on a journey inland. The more scar-tissue there is in and around the uterus, the greater the flexion of the organ, and the narrower the cervical canal, usually the more constant will be the occurrence of pain.

The customary classifications which can be verified by anyone with a few years of practical experience are, for the most part, satisfactory, but the writer has adopted the following as the results of his experience, viz.:—

1. Dysmenorrhœa from congestion.
2. Dysmenorrhœa from obstruction.
3. Dysmenorrhœa from neuroses.
4. Dysmenorrhœa from endometrial hypertrophy.

1. Dysmenorrhœa from congestion. This is the simplest of all the varieties.

Congestion is always and necessarily a feature of menstruation; that is, the current in the pelvic vessels is then more rapid or the tension or volume is greater, or perhaps all these elements are combined. When the degree of this congestion is greater than can be readily tolerated by the person, pain is one of its results (the other results need not concern us now), and this pain will last as long as the congestion continues, and will recur as frequently. Tolerance of this condition to a greater or lesser extent is acquired by many women, just as other disagreeable experiences become tolerable when habitual and inevitable. In some cases the pain seems limited to one or both ovaries, in others to the uterus, and in others it seems to be distributed through the pelvis.

2. Dysmenorrhœa from obstruction. There has been much discussion for many years concerning this variety, some writers going as far as to say that the vascular system of the pelvis was so accommodative that dysmenorrhœa from obstruction was not possible. Clinical facts do not warrant such a statement. Obstruction of the outflow of blood is, perhaps, not so great when the womb is flexed backward or forward as was claimed a few years ago by Sims, Hewitt, and others, especially if coagulation of the blood within the uterus does not occur; but, if such coagulation does take place (and in some cases also in which it does not), dysmenorrhœa will be a very pronounced symptom.

With stenosis of the cervical canal the same difficulty to the outflow of the menstrual product is also frequently observed. With imperforation of the hymen or of the os internum or externum obstruction to outflow is complete. A certain portion of the transuded blood is reabsorbed, but the remainder persists,

distending the vagina or the uterus or both, sometimes producing a very large tumor, and invariably resulting in great pain, which in some cases has led to a fatal result.

Pain from incomplete development of the pelvic organs, especially the uterus, is also to be referred to obstructive dysmenorrhœa as its origin, and, as in certain cases of congestive dysmenorrhœa, the bad symptoms are not limited to pain. Dysmenorrhœa from inflammatory exudate is an acquired symptom, the exudate binding the pelvic organs into a more or less firm mass, which tends to become firmer as the contraction, which time brings with it, takes place. The pain in such cases is not limited to obstruction to outflow; indeed, there is no such obstruction apparent in some of the cases, the flow being profuse in some instances and scanty or absent in others. The remarks concerning inflammatory exudate will also apply to scar-tissue, which, by its presence, will often effectually obstruct the passage of the menstrual blood-current. To this variety of dysmenorrhœa might also be added those cases which are so often seen that depend upon perverted or imperfect nutrition and in which constipation is an ever-present accompanying symptom.

3. Dysmenorrhœa from neuroses. There may be at least two types of this variety; in one of them the neurosis is the sole discoverable source of trouble, in the other it is secondary to disease of some other character within the pelvis.

Hysteria is at the foundation of many of the cases of the first-mentioned variety, the pain connected with menstruation being, to a great extent, simulated or imagined.

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Too much has been made of the local causes of dysmenorrhœa, as it is most

often a symptom of hysteria. Vedeler (Norsk Mag. f. Laegevidensk., No. 10, Oct., '97).

When we realize, however, the intimate anatomical relations which the sympathetic nerves of the pelvic organs bear to the nerves and ganglia of the rest of the organs of the body, we are quite prepared to believe that painful sensations in those organs might be transmitted to the organs of the pelvis. So far as I know there have been no exact investigations upon this subject. The referred or reflected pains from the pelvic to the other organs have been much discussed and a variety of conclusions has been reached. The neuroses in the pelvis or pelvic organs which occasion dysmenorrhœa may constitute a use of language which is somewhat misleading. Of course, all pain is the evidence of nerve-irritation or a neurosis. The form which is here to be considered is that in which, aside from mere congestion or obstruction as an attendant of the menstrual experience, there is a direct irritation of nerve-tissue which is not apparent apart from the menstrual epoch. Such, for example, is the case when the unusual pressure due to the congestion of menstruation is experienced by the sacral nerves as they pass through the pelvis, the tissues being already the seat of inflammatory exudate. The tissues are squeezed and contracted by this exudate; but the addition of the menstrual congestion introduces a further element of pressure, which causes irritation of the nerves which are infringed upon, and pain is experienced, which radiates in the direction of the imprisoned nerves. This condition is not infrequently found in insane women; it is probably a factor in producing insanity, and such insanity cannot be expected to ameliorate perma-

nently until the source of trouble is removed.

4. Dysmenorrhœa membranosa. This is a somewhat rare form of dysmenorrhœa, but one which has long been recognized, and is described by all writers of gynecological treatises.

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During ten years' experience, case of membranous dysmenorrhœa never met with. The spasmodic-neuralgic form without any pathological lesion is also extremely rare. The worst cases are usually due to antelexion. Dilatation gives relief, but must be repeated. There is not any scientific proof that the ovary *per se* ever caused dysmenorrhœa. When no lesion can be found the fault is in the nervous system, and to this the attention must be directed. Fibroma not infrequently causes dysmenorrhœa, even in women under 30. The tumor may be very small and escape notice, unless a careful examination is made under an anæsthetic. Parsons (Brit. Med. Jour., Oct. 24, '97).

Dysmenorrhœa membranosa is due to an hypertrophied condition of the endometrial decidua; that is, of the exfoliative portion of the uterine mucous membrane which is shed at each menstrual epoch. This membrane varies in thickness and density in extreme instances, showing a perfect cast of the cavity of the uterus.

The exfoliated uterine mucosa of membranous dysmenorrhœa presents the lesions of an ordinary endometritis, and can usually, by histological examination, be differentiated from the decidua expelled in early abortion or in ectopic fetation. Sterility is a usual sequence when the trouble is established early in menstrual life. Medicine is of little use, dilatation and the curette giving the best results. Coquard (Revue Médico-Chir. des Mal. des Femmes, Aug. 25, '88).

Separation of the membrane from its underlying attachment and its expulsion from the uterus mean an unusual

amount of uterine work and severe pain as an almost constant accompaniment. It usually occurs, too, in women whose nutrition is defective, and is consequently a matter of more serious importance than if it were among the robust and well nourished. It is, of course, a form of obstructive dysmenorrhœa, but its peculiarities are so marked that it may be well to continue to consider it a distinct variety.

Etiology and Pathology.—Anything which prevents or disturbs the equilibrium of the normal conditions described will cause dysmenorrhœa. It is of exceedingly frequent occurrence. It is a matter of great surprise that so many women should present this symptom, which appears with some of them at the advent of puberty and continues with varying intensity until the termination of menstrual life, while with others it disappears with pregnancy, with the physical changes attending mature life, or as the result of surgical treatment.

That it should occur so frequently, and especially in communities in which the highest intellectual development has been reached, is not a flattering commentary upon the results of modern civilization. Still, this is counterbalanced by the fact that dysmenorrhœa is usually curable by judicious and appropriate surgical means.

A disregard of the function of the female organization in the manner of educating girls is a factor in producing this trouble in very many cases.

Irregularity occurs in consequence of the demand made upon the vital powers at times when there should rightly be an intermission or remission of labor. Dysmenorrhœa is often accompanied by hysterical conditions, which sometimes pass into insanity, and suicidal mania sometimes occurs at the period when the pain is most severe. Eggers (Annals Gyn. and Ped., Dec. 23, '95).

Women in the savage or barbarous state and women who are constantly engaged in out-of-door labor are seldom sufferers from this cause, though their pelvic organs may be defective in structure and though they may habitually be subject to experiences which would unfailingly cause dysmenorrhœa or even complete suppression of the menstrual function in women of less robust organization. This is, in part, owed to the increased power of resistance to physical ills which is favored by an out-of-door life, and, in part, to the greater insensitiveness to pain of women in the lower strata of social and intellectual development.

With those who are sufferers the underlying causes are various, and demonstrate the important rôle which the reproductive organs play, not alone in the propagation of species, but in the experiences of daily life.

One hundred and twelve cases of dysmenorrhœa examined. One of the most striking points is the very large number of sterile women; 44, or a fraction less than 40 per cent., belong to this class. Of those who had been pregnant, 12 had never had a child at full term; 15 more had had a miscarriage since the last full-term child was born, leaving less than 37 per cent. of the total number whose last pregnancy had come to full term. These figures would seem to indicate that, in a large proportion of patients suffering from dysmenorrhœa, there were present lesions which also interfered with conception. One hundred out of the 112 suffering from painful menstruation were found to have some marked organic lesion of the pelvic organs. William S. Gardner (Atlanta Med. and Surg. Jour., Dec., '95).

The causes may be classified as follows, viz.: heredity, disease, occupation, and trauma.

1. Heredity. With many women the defects in the structure of the reproduct-

ive organs are congenital and necessitate dysmenorrhœa.

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Uterine dysmenorrhœa is caused by a malformation of the uterus, due to want of proper development. To this are added the thickening of the mucous membrane and congestion at the time of the menstrual flow. The bend, plus the thickening of the mucous membrane and congestion, is the cause of the pain. On examination, antelexion of the uterus is almost certain to be found. Keith (Brit. Gyn. Jour., Nov., '97).

It does not avail that the remainder of the physical organization is normally developed; indeed, one frequently sees women of the finest physique and superb presence whose incomplete pelvic apparatus condemns them to semi-invalidism during a considerable portion of each month.

On the other hand, puny, delicate women with normally-developed pelvic organs suffer with dysmenorrhœa on account of their perverted general nutrition, their flabby muscular system, and their low-ebb vitality, to which the recurring monthly congestion brings a strain which they are ill fitted to bear.

The defective organization may include any portion of the genital apparatus; in the vulva it may take the form of an impermeable hymen, producing an absolute barrier to the discharge of imprisoned blood; in the vagina it may consist of bands and septa with almost equal obstruction to the outflow of the menstrual fluid; in the uterus it may be an almost-impervious cervical canal, an occluded os internum or externum, less frequently a rudimentary corpus uteri or one with its two halves uncoalesced or its canal obliterated; in the tubes or ovaries the structure may be rudimentary or the seat of some form of congenital disease.

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Stenosis may be due to swelling of the mucous membrane occurring only at the time of menstruation, and consequently impossible to diagnose at other times. Treub (*Centralb. f. Gynäk.*, July 17, '97).

Dysmenorrhœa should be divided into dysmenorrhœal endometritis and uterine spasm. The first includes all forms in which there is any local mechanical obstacle; all other cases are uterine spasm, which affects the sphincter of the uterus, —that is, the cervix. Of 167 patients observed, 37 complained of painful menstruation. In 32 a local cause was discovered, but in the 5 others, virgins, the affection was spasmodic. Besides there were 21 who had manifest stenosis without painful menstruation. Among these subjected to curetting there were 17 with dysmenorrhœa, but only 1 had marked stenosis. Of these last, 8 were completely cured by curetting; of the 9 others, 7 returned with a relapse of their old trouble, and 2 received absolutely no relief. De Leon (*Centralb. f. Gynäk.*, July 17, '97).

Painful menstruation often co-exists with acute ante flexion of the uterus. The class of patients who suffer from this type of disease are usually, if married, sterile, and the supervention of pregnancy often effects a cure. Williams (*Brit. Med. Jour.*, Oct. 24, '97).

In all cases thus connected with heredity, defective organization, etc., recurring monthly congestion produces tension in poorly-conditioned structures, and, if the tension in the vessels is sufficient to result in transudation of their contents, the outlet being imperfect or wanting, pain will be the inevitable result.

2. Disease. Disease of one kind or another may cause dysmenorrhœa, whether the disease occurs before or after puberty. Before puberty there are many forms of disease which arrest the development of the pelvic organs and result in dysmenorrhœa. The exanthemata seem to be especially productive of this effect. Why

this should follow has not been satisfactorily explained. Measles, scarlet fever, small-pox, all have their victims in whom such a result has been observed.

Of the diseases subsequent to puberty which produce dysmenorrhœa there are those which are local and others which are general. Of the former may be mentioned fibroid tumors either within the uterine canal, in its muscular substance, or within its peritoneum, and inflammatory disease of the tubes of the ovaries or of the pelvic peritoneum. All these diseases may, by their obstructive effect, prevent free discharge of blood during the menstrual epoch, and produce pain. Of the general diseases may be mentioned typhoid fever, certain diseases of the liver and gall-bladder, anæmia, etc.

The same result is often seen in cases in which there is excessive development of fat. Women who become very obese are very frequently sufferers from dysmenorrhœa.

3. Occupation. Some occupations are especially prone to result in dysmenorrhœa. Those who work in a very hot atmosphere, like cooks and laundresses; those who are constantly exposed to cold and dampness, like fishwives or workers in mines (unwomanly occupations); those who work in poisonous substances, —copper, arsenic, lead, phosphorus, and sulphur; those who are confined for long hours in factories, stores, and tenement-house "sweat-shops" are, in many instances, sufferers with dysmenorrhœa.

[It is a pity that civilization, which has done so much to ameliorate many physical evils, has also brought in its wake many others. The field for philanthropy and preventive medicine, in this direction, is a very wide one, and legislation has yet much to do in emancipating women from such distressing experience. A. F. CURRIER.]

4. Trauma. Dysmenorrhœa from this

cause is, in most cases, the result of difficult parturition, the genital organs sustaining severe injuries and cicatrization and contraction ensuing. The hardened tissues are anæmic and the necessary elimination of blood is accomplished with difficulty and pain. Occasionally there are direct injuries to the genital organs, apart from parturition, which also produce deterioration of the tissues of those organs, and are likewise followed by painful menstruation.

Prognosis.—The prognosis in dysmenorrhœa varies with the conditions and varies also with the treatment. If it depends upon structural defects, and those defects are remediable, a cure will result. It sometimes persists during the whole menstrual life, but with many women it gradually becomes tolerable, as all ills which are long endured become tolerable.

With regard to prognosis much will depend upon the general condition of the subject, great improvement in that direction often leading to menstruation, which is less painful or not painful at all. The prognosis in cases in which drug-treatment alone is used is very uncertain; while such treatment is proper enough simply as a means of relieving or benumbing pain, it has nothing more than a temporary and palliative effect when the pain is due to an anatomical fault or defect.

Treatment.—It might be quite apparent from the foregoing that, while the treatment may be either medical or surgical, the latter, however, will usually give the more satisfactory and radical results. Modern gynæcology is cast in surgical lines, and while it would be folly to deny that many mistakes have been made in its name (for mistakes are always made in the development of a new department of knowledge), it has ap-

proached nearer to fundamental conditions by directly attacking tissues which are involved in disease than have other methods of treatment which are more circuitous in their course.

Considering the subject of treatment, therefore, as divisible into palliative and radical, the former will include the methods by means of drugs (which occasionally may produce a permanent result), and the latter (which do not infallibly produce a cure) those methods which involve surgical procedures. Of course, a judicious combination of both medical and surgical means will often prove efficacious.

Of the drugs which may be given to relieve the pain of menstruation, morphine combined with atropine should be reserved for very rare cases whether given by the mouth or hypodermically. It should be given in the smallest possible doses, $\frac{1}{8}$ grain sufficing to relieve pain in most cases as well as a larger quantity. One must not forget the seductive influence of this drug, especially upon real nervous, hysterical women. Many women find relief from the pain in question by drinking hot herb-teas: chamomile, scutellarium, boneset, flaxseed, etc. These can do no harm and are innocent as to the formation of drug-habits.

More or less meritorious preparations are much in vogue, but in some cases they seem to be entirely inert, either from instability or want of uniformity in the preparation or some peculiarity in the patient.

Oxalate of cerium, in 6-grain doses every hour, considered specific for the dysmenorrhœa of well-nourished, robust women, in cases where the pain comes at or before the beginning of the flow. Chambers (Med. Record, July 7, '88).

In neurotic cases with considerable general disturbance 20 grains of anti-pyrine work like a charm, the best effect being obtained when the patient lies

with closed eyes in a quiet room for half an hour after taking it. Segur (Proceed. Conn. Med. Society, '88).

Pulsatilla in the form of a tincture of the fresh leaves, 10 minims three or four times a day, is particularly praised. Segur (Med. Chronicle, Feb. 2, '89).

Apiolin is especially indicated in spasmodic and congestive dysmenorrhœa, in doses of 3 minims in capsules, three times a day. Hill (Med. Standard, June, '91).

In non-inflammatory cases viburnum prunifolium gives brilliant results, not to be obtained from any other remedy except morphine. A teaspoonful of the fluid extract three times daily to be given. Schwartze (Ther. Gaz., Aug. 15, '94).

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Cases in which the flow is ushered in by severe cramp-like pains for three or four days preceding the menstruation $\frac{1}{2}$ -drachm doses of the fluid extract of viburnum prunifolium in hot water three times a day may be given, and on the morning of the expected period a full dose of magnesium sulphate. If the pain comes on in spite of this, 5-grain doses of antipyrine, repeated every two hours for three doses, if necessary, will often relieve it. Arthur A. Browne (Montreal Med. Jour., Apr., '98).

The following formula has given good results:—

R Tincture of hydrastis Canadensis,

Tincture of viburnum prunifolium,
of each, equal parts.

M. Ten drops to be taken every two hours. Lutaud (Jour. de Méd. de Paris, Jan. 2, '98).

Manganese is a most valuable remedy in unmarried women, and a trial extending over three months is recommended before relinquishing its use. Its action appears to be upon the nerves or nerve-centres concerned in the menstrual function rather than upon the blood. Administration of manganese does not interfere in any way with iron and vegetable tonics, but rather enhances their effects. The black oxide is the most convenient form of prescription. If nausea is produced the drug

should be given in a small dose: 1 grain at a time gradually increased. A 3-grain dose is found to be as efficacious as a larger one. Charles O'Donovan (Med. News, Nov. 27, '97).

The various currents of electricity have all been vaunted as useful means of treatment, and in many cases they are prompt in producing relief. Especially is this true of the faradic current, but if the cause of the trouble lies in a defect of structure it would be unreasonable to expect a permanent result from electrical treatment so long as the cause remains.

Good results from a mild galvanic current passed from suprapubic region to sacrum twice a week for several weeks. Williams (Epitome, Sept., '88).

Other palliative measures are warm hip-baths in which the patient may sit ten to fifteen minutes, the temperature of the water being sufficient to produce relaxation of tissue, and hot mustard-water foot-baths, which must be used only long enough to produce a glow of the skin.

Hot salt-baths calm the pains of dysmenorrhœa and notably diminish menstrual flow. Mironoff (Ejenedelnoya, No. 35, '95).

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In ovarian dysmenorrhœa all remedies which are likely to relieve pelvic congestion should be employed, such as hot injections and sitz-baths, hot-water bags to the lower part of the abdomen, and saline laxatives. Internal medication is of very little avail. In cases, however, in which menstruation is not profuse the mother-tincture of pulsatilla in 5-drop doses every three hours is very useful. Mundé (Med. Brief, May, '96).

With mud-baths and the medicated waters of Kreznach, Aix, Toplitz, Schwalbach, and other well-known European resorts useful results have been obtained, but they are not available for the majority of our American patients.

A change of residence, especially from the sea-shore or near the sea-level to an elevation of one or two thousand feet, will often give permanent relief. The writer has repeatedly seen women who menstruate with great discomfort at the sea-shore, while on sea-voyages, or in a damp atmosphere under some other conditions. Of course, if there is no anatomical lesion one usually becomes habituated to atmospheric conditions after a few months or years.

If the pain is due to a neurosis the treatment should be addressed to the nervous system,—the bromides, hyoscyamus, aconite, and the coal-tar preparations being employed.

If the general nutrition is at fault it is hardly necessary to say that it should be improved by a carefully-selected diet, suitable exercise, cheerful companionship, and always and above all by the use of approved laxatives to keep the bowels freely open. Again and again has the writer found a constipated habit at the bottom of a history of painful menstruation.

The majority of cases of dysmenorrhœa in school-girls is functional in origin. Environment should be such as would be most conducive to their general health. They should be kept out of school during their first menstrual year, and those of a nervous temperament for a longer period of time. They should have calisthenic training for the special development of the muscles of the back and abdomen, and should be warmly clothed. If there is any tendency to pain during menstruation, the young patient should be put to bed and kept there the entire period. Pine (*Northwestern Lancet*, Dec. 15, '89).

The field of surgical treatment for dysmenorrhœa is a large one and frequently will result in the happiest consequences. The chief objects of surgical treatment are to relieve obstruction, to

produce stimulation, and to improve local nutrition.

The causes of obstruction have been mentioned, and should be removed as completely as possible; an imperforate hymen should be divided or dissected away; obstructing bands in the vagina should be cut and a series of vaginal dilators worn until the normal caliber of the vagina has been restored. Bands and constrictions at the os externum or internum should be divided, a narrow cervical canal should be dilated and curetted, especially when the glands are the seat of exuberant or unhealthy secretion.

[The most efficient treatment for ordinary forms of dysmenorrhœa is careful dilatation, with the steel dilator, to the extent of an inch or an inch and a quarter, using careful antiseptic precautions. After the dilatation it is well to insert an intra-uterine pencil containing 10 grains of iodoform. MUNDE and WELLS, *Assoc. Ed.*, Annual, '89.]

Slow dilatation urged as being equally effective and less dangerous than rapid dilatation. Talbot (*Amer. Jour. of Obstet.*, Jan., '89).

Rapid dilatation for the relief of dysmenorrhœa depending upon flexion or obstruction is advocated, in the absence of contra-indications. Goodell (*Amer. Lancet*, July, '89); Dickman (*Kansas Med. Catalogue*, June, '89); Townsend (*Amer. Jour. of Obstet.*, Dec., '89); Madden (*Satellite of the Annual*, Sept., '89).

Repeated curettings at short intervals advocated for membranous dysmenorrhœa. After each curetting the canal should be carefully treated to an application of pure carbolic acid. Reamy (*N. Y. Med. Jour.*, June 10, '93).

For membranous dysmenorrhœa, scarification of the os externum at intervals of three or four days between the periods is recommended. Just before the flow is expected the cervix is dilated, the interior of the uterus thoroughly curetted, and a spiral-wire stem introduced; this is worn continuously during at least three subsequent periods, the patient being directed to take hot vaginal douches

even when menstruating. Duke (Med. Press and Circ., July 10, '95).

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The spasmodic variety is by far the most common, as there is frequently little to be detected beyond the symptom of severe spasmodic pain. Some relief may be obtained by sedatives externally or internally, but there is always the danger of setting up an opium or chloral habit; it is better to dilate the uterus, either by tents or solid instruments. The use of tents is not free from danger, both from sepsis and from fracture or tearing away of a piece of the tent upon extraction. To effect rapid dilatation the solid dilator well regulated is to be chosen. The uterus can be easily secured by the vulsellum forceps if a sound is previously introduced into the cavity, and a series of dilators can then be passed rapidly, with the result that the patient is relieved, at least for many months. Murdoch Cameron (Brit. Med. Jour., Oct. 24, '97).

Dysmenorrhœa is successfully treated by applications to the mucous membrane of the uterine cavity. The treatment consists in the injection of 10 minims of 3-per-cent. mixture of Churchill's tincture of iodine and water into the uterine cavity every four or five days during the intermenstrual period, beginning about five days after the flow has ceased, and giving the last treatment about five days before the next period begins. As an injector a fine glass tube, curved an inch from one end and expanded into a funnel shape at the other, is used. A piece of sheet rubber covers this end, and by the pressure of the finger the contents are passed into the uterine cavity. A speculum is not necessary, the majority of cases being unmarried. The pain and exposure made necessary by the use of a speculum is objected to. Langstaff (Brooklyn Med. Jour., May, '97).

In sterile married women prescription of abstinence from marital relations for longer or shorter time, followed by free dilatation immediately before their resumption, often proves successful in curing dysmenorrhœa. Bicycling is of ad-

vantage, and if growing girls, especially when anæmic, were systematically encouraged to practice that exercise in moderation, we should by and by have less spasmodic dysmenorrhœa. Connel (Brit. Med. Jour., Oct. 24, '97).

In every case, without exception, general treatment must be most thoroughly tried first. At the time of puberty many girls get far too little exercise, and too little care is taken to keep them warm, especially at night. It is essential that the feet be kept warm during the night whenever there is uterine dysmenorrhœa, or, indeed, whenever there is any pelvic trouble. As soon as there is the slightest appearance of the "period" the girl must be kept rigidly in bed, and not allowed to get up until the pain is entirely gone. A large poultice should be kept over the abdomen. A brisk saline draught at the commencement, or, if possible, twelve hours before, and then a mild diaphoretic, with a small dose of bromide of sodium or potassium, if the patient be strong, or if weak some aromatic spirit of ammonia are best.

In regard to the local treatment there is more or less difference of opinion. The stem-pessary is unscientific; it can only relieve, seldom cures, and may do harm. Dilatation consists of two kinds: slight and great. The first is suitable in the case of married women, when the flexion is not great, and it is used in the hope that by distending the canal impregnation may take place, and the dysmenorrhœa thus be cured. An anæsthetic is not required. Overdilatation may be done with tents or the rapid forcible method. Whatever instrument is used in the rapid method, the stretching ought to be carried out while the uterus is fixed by tenaculum in its natural position; not when it is drawn to or outside the vulva. Keith (Med. Press and Circ., Oct. 27, '97).

Obstruction from the presence of tumors within the uterus which may cause excessive pain can be relieved only by their removal, and the requisite operations must also be performed if the dysmenorrhœa is caused by displacements of

the uterus or its incarceration by inflammatory exudate. Any less radical form of treatment for such conditions has, in the experience of the writer, proved to be only time-consuming and futile.

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The causes of dysmenorrhœa may be either extra-uterine or intra-uterine. The treatment differs markedly in the two classes of cases, and what would relieve in one would be worse than useless in the other. Three factors are concerned in the production of the pain of dysmenorrhœa, viz.: contraction of the muscular fibres of the uterus or Fallopian tubes; increased spasm or blood-pressure in the tissues of uterus or appendages,—congestion; neuralgia of the uterus or the appendages. The cause is to be treated. Nearly all cases are benefited by rest at the periods, hot vaginal douches during and between the periods, and, in inflammatory cases, tampons of glycerin and ichthyol, and saline aperients. Morphine and alcohol will give great relief, but must never be recommended; the administration of alcohol to young women at such times is to be blamed for much of the secret drinking that prevails. The drugs most useful are bromides and belladonna, antipyrine and cannabis Indica, and both viburnum prunifolium and viburnum opulus. Operative measures should only be resorted to when other and less severe remedies have failed. In cases due to spasmodic contraction of uterus or stenosis of cervix (if there be no signs of extra-uterine disease) dilatation is often of some service, but is seldom of more than temporary benefit. In cases due to chronic pelvic peritonitis, binding down and matting together the uterus, ovaries, and tubes,—cases in which the ovaries are cystic and the tubes, perhaps, occluded

and the uterus retroverted and adherent to the rectum,—very marked and permanent benefit results from a “conservative operation” on the appendages. The abdomen should be opened, the uterus, ovaries, and tubes freed from the adhesions, and after ignipuncture of the cystic or sclerosed ovaries the fundus fixed to anterior abdominal wall. In grave and otherwise incurable lesions of the appendages, such as abscesses of the ovary or pyosalpinx, the removal of the diseased organ is strongly indicated. Martin (Brit. Med. Jour., Oct. 24, '97).

The use of pessaries for the relief of displacements, while it frequently modifies the dysmenorrhœa, seldom cures the displacements; hence such means are used with far less frequency than formerly. The same may be said of the cutting operations which were once so popular for the relief of dysmenorrhœa supposed to be the results of ante flexion of the uterus.

Stimulation of the uterus and improvement of its nutrition are often effectively produced by the passage of graduated sounds into its canal, the use of the steel dilators, curettage, and occasionally by the abstraction of blood from the cervix with leeches, or by punctures or scarification, especially when the cervix is congested and the menstrual flow is scanty.

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DYSPEPSIA. See STOMACH, DISORDERS OF.

DYSTOCIA. See PARTURITION.

E

EARACHE. See EXTERNAL EAR, DISEASES OF.

ECLAMPSIA.—Gr., *ἐκλαμψις*, a shining forth.

Synonym.—Puerperal convulsions.

Definition.—Eclampsia is a symptomatic disorder characterized by convulsive or epileptiform seizures that suddenly come on prior to, during, or after labor.

Symptoms.—The physician who systematically examines the urine not alone for albumin and casts, but also for urea, and who keeps check of the amount of urine passed in the twenty-four hours is not likely to be caught napping even in those cases in which, although there never has been a suspicion of renal impairment, the kidneys are nevertheless diseased. *Pari passu* with diminished excretion of urea the risk of toxæmia increases, and the most dangerous form of eclampsia—that which develops suddenly (without much premonition) and passes into coma and death—frequently depends on urinary insufficiency as regards excretion.

The clinical history of cases of the form of toxæmia under consideration is variable. As a rule, there exists a premonitory symptomatology, consisting in cephalalgia and dimness of vision or alteration from that which is normal in the person.

Instances of convulsions during pregnancy observed in which every fit was regularly preceded by transitory amaurosis, as well as by œdema of the face, which was also of short duration. Two sets of convulsions occurred during pregnancy: the first about the end of the seventh month, four attacks taking place within twenty-four hours; the second in the course of the eighth month, when two fits were observed. After the last convulsion a healthy child was delivered.

The mother made a good recovery. The two prominent symptoms above mentioned developed before each of the six fits. Olshausen has been able to collect only three cases of eclampsia in which the fit was preceded by an aura, as was this case. Rabeczewsky (*Przegląd Chirurgiczny*, vol. ii, Pt. 3, '95).

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Rarely are convulsions unheralded. In the vast majority of cases there were prodromal symptoms. Frequent urinary analyses, both qualitative and quantitative, should be made, and, if albumin is found or the amount of the solids greatly diminished, suspicion should be aroused. Any abnormal symptoms—such as headache, disturbances of vision, or œdema—should put us on our guard. When such symptoms appear the patient must be put on a milk diet with large quantities of sterilized water; hot baths employed, and the bowels kept active by catharsis and saline enemas. The continuance of these symptoms demands induced labor.

In post-partum eclampsia, if the patient is plethoric and vigorous, venesection is the best remedy; if anæmic and weak, veratrum, accompanied by the transfusion of the salt solution, is indicated. H. D. Thomason (*Med. Record*, May 23, '96).

Albumin and casts may or may not be present in the urine according to whether a nephritis complicates the pregnancy or not. Should the premonitory symptoms be aggravated elimination of urea is defective, as shown by the recognized tests. Insufficiency on the part of the kidneys may be determined by measuring the amount of urine passed in the twenty-four hours. Vascular tension is apt to be increased except in women of an anæmic type; œdema, as a rule, accompanies organic renal disease.

The symptomatology of the eclamptic seizure is characteristic. The wide-open

eyes, fixed in vacant stare; the contracted pupils, the rapidly opening and closing lids, the clonic convulsions. These symptoms accompany, ordinarily, the first seizures. The heart's action becomes irregular, the face is cyanosed, the breathing stertorous. Soon the convulsions become tonic in character; the eyes are fixed; opisthotonos may set in.

The number of seizures are variable, as many as one hundred and twenty-five in the twenty-four hours have been noted. The duration of the seizures is from about thirty seconds to a minute, and in the intervals the woman is conscious; or else the first seizure merges into coma and ends in death. Generally, after delivery of the fœtus the convulsions cease. Rarely eclampsia develops after delivery.

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In the course of four and a half years, among 4480 cases of childbirth, the proportion of cases of eclampsia was 4.9 per thousand. Of the 4480, 2383 were primiparæ and 2097 multiparæ; 16 of these cases of eclampsia were primiparæ, and 6 multiparæ; that is, equal to 72.7 per cent. of primiparæ to 27.3 per cent. of multiparæ. Braun found the percentage of primiparæ 86.3; Löhlein, 85.4; Schauta, 82.6; v. Winckel, 76.8; and Olshausen, 74 per cent. Women attacked with eclampsia were, for the most part, young. The first convulsive seizure occurred before labor in 2 cases, during labor in 15, and after labor in 5 cases. The extent of the discrepancy as to antepartum eclampsia is well brought out by the following figures: Löhlein gives 4.7 per cent., Strumpf, 7.4; v. Rosthorn, 9.1; Schauta, 14; v. Winckel, 23; Braun, 24; and Olshausen, 40 per cent.

The convulsions ended at the termination of labor in 8 of the 22 cases. The duration of the convulsions was, on the average, one minute. The severity of an eclamptic seizure is only to be measured by its influence on the respiration and the action of the heart. There was

albuminuria in the whole of the cases. Knapp (*Monats. f. Geburts. u. Gynäk.*, B. 3, May and June, '96).

Nature frequently teaches us the line of action—spontaneous abortion occurring and the eclampsia ceasing.

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Inasmuch as convulsive attacks may persist after delivery, or even in rare cases may appear for the first time after delivery is completed, the plan of hurrying on labor with the object of checking the attacks must necessarily be often completely inefficacious. We may, therefore, conclude that it is not in the evacuation of the uterus that the cure for eclampsia is to be sought. The toxic condition of the blood dominates everything else, and it is on the degree of toxicity, which is so difficult to determine, that the prognosis of the disease depends. Maygrier (*Jour. de Méd. de Paris*, Aug. 8, '97).

The victims of nephritis who become pregnant rarely go to term, but abort a dead fœtus, the result of interstitial alterations in the placenta.

Etiology and Pathology.—Modern belief teaches that eclampsia is the result of a toxæmia. The acceptance of this broad term has done much toward the adoption of a rational method of treatment. The definitions which for long prevailed in medical literature simply complicated the topic. Thus the view that eclampsia depended on pressure of the gravid uterus on the renal vessels, while negated by the fact that such pressure exercised by ovarian and fibroid growths was unaccompanied by eclampsia, and, further, that the gravid uterus, when risen above the pelvic brim, exerted no such mechanical interference with the kidneys, led the mind of the observer far astray from a strong presumptive etiological factor, which is deficient excretion of toxic products em-

anating not alone from the kidneys, but also from the liver.

There are some cases of puerperal eclampsia due to an organism which causes infectious nephritis, and which appears itself to generate a convulsive poison. Blanc (*Lyon Médical*, May 12, '89).

Eclampsia is the result of a complex irritant poison, which is produced not only by failure of excretion by the kidneys, but also by failure in the action of the liver, the skin, the lungs, and the intestines. E. P. Davis (*Therap. Gaz.*, July 15, '95).

Eclampsia is not properly a disease. It is the culmination of certain conditions, with one constant exciting cause. The great predisposing cause is the retention within the body, not necessarily alone of urea, but of the products of metabolism and decomposition, especially from the fœtus. The immediate exciting cause of the convulsions is in the uterus, and, because of their greater blood- and nerve-supply, in the cervix and os. M. A. Southworth (*Pacific Med. Jour.*, Jan., '95).

Corpulent women are more subject to puerperal eclampsia than others. Mechanical pressure from the growing uterus embarrasses the functions of the kidneys and uterus, causing albuminuria where it had not previously existed and aggravating it in cases in which it was present. Simmons (*Jour. of Mat. Med.*, June, '95).

Eclampsia is an acute peripheral epilepsy, having its origin in the uterus. Santos (*Archiv für Gynäk.*, B. 32, H. 3, '88).

Eclampsia is the result of a disturbed liver-function conditioning an incomplete oxidation and the consequent production of carbonic acid. In the body of every pregnant woman, but especially toward the end of gestation, there circulate increased quantities of incompletely-oxidized substances: leucomaines. These become excessive if the functions of the kidney and liver are faulty. But even this abnormally-large amount of toxic substances will not produce serious symptoms unless the psychological equilibrium of the subject is disturbed. This

explains why eclampsia is mostly found in primiparæ, and why hydramnion, multiple pregnancy, pelvic contraction, and abnormal presentations are so abnormally frequent. Eclampsia is most easily produced in cases in which labor is slow and painful. W. N. Massin (*Cent. f. Gynæc.*, No. 42, '95).

In Belgium, Sweden, and the States bordering on the Ohio cases of eclampsia are numerous. The earth in these regions is exceedingly calcareous, and perhaps the lime-salts ingested in the drinking-water favor the formation of toxic materials in the blood which, combined with the nervous condition peculiar to pregnancy, give rise to eclampsia. Raikes (*Canadian Pract.*, Sept. 1, '92).

The cause of eclampsia is reflex, culminating in a cerebro-spinal centre in close proximity to the disorganized centre which presides over the existence of albuminuria. Albuminuria simply predisposes to attacks, but does not act as the exciting cause. Pajot (*Med. Press and Circ.*, Aug. 8, '88).

The eclampsia symptom-complex is dependent on a peculiar irritation change in the psychomotor centres of the cerebral cortex (subcortical centres). This zone develops during gestation on an existing disposition, which may be either congenital or acquired. Herff (*Münchener med. Woch.*, No. 5, '91).

Eclampsia of pregnancy attributed to a toxin produced by a special microbe, acting upon the nervous system, already prepared by the gravid state. Herrgott (*Revue Méd. de l'Est.*, Feb. 1, '93).

Puerperal eclampsia is due to the action on the cerebrum of substances formed in the evolution of a local infective process. Jenkins (*Glasgow Med. Jour.*, June, '94).

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Puerperal eclampsia originates from a renal insufficiency causing a high arterial pressure, this again reacting on the motor areas of the brain, producing the characteristic epileptiform manifestations in the parts of the body presided over by the centres which are subject to the abnormal blood-pressure. R. Maxwell-Trotter (*Brit. Med. Jour.*, May 9, '96).

Renal insufficiency cannot be considered as the primary cause of convulsions; but more probably the etiology of the condition is to be found in defective hepatic activity. Tarnier has demonstrated that under normal conditions a certain amount of fatty degeneration of liver-cells is present during pregnancy; and Tibone describes, in the livers of patients dying from eclampsia, marked changes, consisting in capillary dilation and the formation of necrotic patches and infarcts. From the presence of acetone in large quantities, it is suggested that there is present an abnormal decomposition of organized proteids, or may be an imperfect elimination of the non-nitrogenous products of retrograde metamorphosis, due to the fatty degeneration of the liver-cells, whose activity is overburdened by the increase of biliary salts derived from the fœtus, and which must be eliminated by means of the maternal liver. From the further decomposition of these retained carbohydrate products, convulsive poisons and acetone are developed; and, at the same time, from the faulty action of the liver not completely changing waste nitrogenous products into urea, bodies which irritate and inflame the kidneys in their elimination cause further insufficiency of renal action. That the bile-acids in the fœtal meconium are probably a factor in the production of eclampsia is strongly supported by the fact that after death of the fœtus *in utero* albuminuria of pregnancy ceases. Clark and Skelton (Amer. Jour. Obst., Feb., '97).

Distinct pathological lesions observed in the liver and kidneys in thirteen cases of fatal eclampsia. Degeneration of the hepatic cells and vessels seems to be the primary change; the hæmorrhages noted in the substance of the liver are secondary. Bar and Guyeisse (Annales de Gynéc. et d'Obst., June, '97).

Though the pathogenesis of eclampsia is unsettled, it belongs solely to the pregnant or puerperal state. It is not apoplectic, epileptic, or hysterical in character. It depends upon toxæmia due to overproduction of toxins and under-elimination by the emunctories. These toxins probably have their origin in the

ingesta, in intestinal putrefaction, in fœtal metabolism—one or all—and there is co-existing sluggishness, impairment, or suspension of elimination. When the prodromes of eclampsia appear, the kidney should be interrogated as to its functions and all symptoms carefully watched. W. W. Potter (Amer. Jour. Obst., Nov., '97).

The cause of pregnancy-kidney is probably an autointoxication of the organism by a product of metabolism during pregnancy. The overloading of the organism with this virus gives rise to eclampsia. The changes which occur in the kidneys, liver, and other organs in the eclamptic are of a secondary character. Saft (Archiv f. Gynäk., vol. li, p. 2).

As in the course of more extended knowledge, the etiological factor of eclampsia was recognized as being associated with hydræmia of the blood and with toxæmia, not alone has the pressure theory been exploded, but so also have the vague and insufficient terms *uræmia* and *urinæmia* been discountenanced by the modern writer, teacher, and practitioner.

During pregnancy the blood alters both in quantity and quality. There is an increase in the white cells and a decrease in the red. Albumin and iron fall below the normal. The blood becomes more watery, so to speak.

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Careful histological studies made of the various organs in a large number of cases of puerperal eclampsia. In the vessels were found large multinucleated cells, which were considered to be cells derived from the placenta, and also multiple capillary thrombosis. From these facts the conclusion drawn that the disease is essentially due to the presence in the blood of a coagulating ferment formed either by the degeneration of the free placental cells found in the blood or by degenerative changes in the placenta itself. Schmorl (Virchow's Archiv; St. Louis Med. and Surg. Jour., May, '96).

Chamberlent, working under the direction of Tarnier, in 1892 performed a series of experiments on the blood of eclamptic women and published the following conclusions:—

1. Pregnancy tends to the retention of poisons in the body, for the urine of the pregnant woman is less poisonous than normal.

2. In eclampsia the elimination of physiological poisons is hindered, and the urine is less poisonous than normal. It is also less poisonous than the urine of normally pregnant women.

3. The blood-serum of the eclamptic is considerably more poisonous than normal, and its toxicity is in direct proportion to that of the urine.

The poison is by some believed to have its origin in the fœtus and placenta; but the commonly-accepted view is that the poison is of maternal origin from impaired metabolism, together with retention from impaired eliminative capacity of the kidneys.

The albuminuria of eclampsia is probably secondary, following the direct action of the poison on the renal epithelial cells, in the effort at elimination. Its almost universal presence in the eclamptic renders it a sign of some importance. Only about one-eighth of eclamptics subsequently develop nephritis, the albumin disappearing from the urine in from a few weeks to a few months after the attack, depending largely on the hygienic conditions which surround the patient. While a patient with nephritis may and does sometimes have eclampsia, it is by no means the invariable rule. J. L. Rothrock (*Northwestern Lancet*, Nov. 15, '97).

That the blood-serum of eclamptics is more toxic than normal cannot be proved; but, on the contrary, the blood-serum of eclamptics produces, when injected into animals, the same symptoms caused by normal serum.

Both blood-serums produce dissolution of blood-corpuscles and hæmoglobinuria; both affect most powerfully when injected continuously. Volhard (*Monats. f. Geburts. u. Gynäk.*, B. 5, H. 5, '97).

The systemic cell-activity in the pregnant woman is greatly increased.

Excrementitious material accumulates rapidly in the system, and at any time the balance between secretion and excretion may become disturbed and a toxæmia or poisoning ensue. If this is apt to occur in a woman conceiving with normal or healthy excretory organs, all the more so is it likely to supervene in a woman who conceives in the presence of an organic disease of one or another of the excretory organs—especially the kidneys. Thus then we may witness eclampsia develop during the pregnancy of a woman with kidneys diseased from the start or in women in whom possibly there has never been a suspicion of renal impairment.

Eclampsia is not common in women the subjects of chronic kidney disease before pregnancy; where kidney symptoms are present they usually develop suddenly; kidney-lesions may be absent; albuminuria is in many cases the effect and not the cause. The kidneys are not the only excretory organs whose failure to perform elimination properly may produce eclampsia. Ptomaine poisoning should not be forgotten. J. P. Boyd (*Albany Med. Annals*, Nov., '95).

Prognosis.—The prognosis in modern times has been greatly altered for the better. Whereas formerly the maternal mortality ranged about 30 per cent., nowadays there are series of cases recorded with as low a rate as 5 per cent. Some observers in a limited number of cases report no deaths. The fœtal mortality remains about 50 per cent.

In 52,328 cases of labor occurring within a period of 2 years there were 325 convulsions. The mortality was 19.38 per cent. Among 248 patients who survived the attacks, 54 subsequently developed other conditions; in 13 there were psychoses, generally ending in recovery; in 5 pneumonia, 3 pleurisy, and in 22 kidney trouble persisted. In 71.1 per cent. operative interference became necessary, including 108 forceps deliv-

eries, 19 versions, 13 operations to lessen the size of the child, 2 induced abortions, and 7 Cæsarian sections. Löhlein (Wiener medicin. Woch., Sept. 19, '91).

If the amount of urea in the blood is twice the normal, recovery is probable, while if it very nearly approach the physiological proportion the termination is generally fatal. This is also the case when the amount of the urea is five or six times the normal. More importance should be attached to the hepatic than to the renal lesions. Butte (*Revue Méd. de l'Est*, May, '93).

Series of 5000 labors in which there were 50 cases of eclampsia,—42 in primiparæ. Twelve mothers died: 10 from eclampsia, 1 from nephritis, and 1 from sepsis. Geuer (*Centralb. f. Gynäk.*, No. 42, '94).

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Maternal mortality in eclampsia, 30 per cent.; fetal mortality, 46.6 per cent. Tarnier (*Annual*, '96).

Series of 42,607 confinement cases 137—0.321 per cent. of which suffered from eclampsia, 19 being already unconscious and many others having had many fits before being admitted to the clinic. Of the mothers, 109—79.5 per cent.—were primiparæ; 113 (97 I-paræ) were not more than 30 years old. One only had had eclampsia in a previous (first) confinement (IV-para; Cæsarean section). Twins are noted 12 times; hydrocephalus, hydramnion, and low lateral placenta, 1 each; abnormal rotation, twice; abnormal pelves, 9 times; 3 breech cases. The attacks commenced before labor in 16.78 per cent., during it in 62.04 per cent., and after delivery in 21.16 per cent. of the cases; and while 53.17 per cent. had less than 5 fits, the average number of fits in 126 was 8. Omitting the 34 children of 29 *post-partum* cases, of the remaining 115, 37—32.1 per cent.—were stillborn, and 56—48.6 per cent.—were premature. In 50.7 per cent. of the whole, or 64.7 per cent. of the cases before delivery, emptying the uterus had a good effect. Of 27 deaths (19.7 per cent.), 17 only were due to eclampsia alone (12.4 per cent.). The mortality of multiparæ (6=21.4 per

cent.) was greater than that of primiparæ (21=19.2 per cent.). The relative mortality of cases commencing before, during, or after childbirth was 30.43 per cent., 18.82 per cent., and 13.79 per cent. The proportion of deaths is comparatively low, and with the fact shown that delivery without too active interference tends to stop the fits is sufficient to warrant the adoption of conservative treatment for eclampsia. The practice of the Vienna clinic for many years has been a prophylactic milk diet for all albuminuric pregnant women; if this fail, the induction of labor by bougie or colpeurynter. On the outbreak of eclampsia hot baths, linden-tea, wet packing, chloroform, and delivery as soon as may be without incisions. Schreiber (*Arch. f. Gyn.*, li, 335, '96).

Treatment.—The treatment of eclampsia may be considered to advantage under the following headings: (1) prophylactic; (2) medicinal; (3) surgical.

Prophylactic Treatment.—If the pregnant woman has been carefully watched by the medical attendant, only exceptionally will eclampsia develop, because the institution of certain prophylactic measures or early resort to certain surgical measures will nullify or prevent the development of certain phenomena which apparently underlie or enter into the causation. Thus, it is not sufficient, after a perfunctory fashion, to examine the urine for albumin, but the total amount passed and the amount of urea contained in it should be ascertained at intervals. Further still, explicit directions should be given in regard to the necessity of securing free action of the sudoriparous glands by means of frequent baths, and thorough action of the intestinal canal should be maintained. When the excretory organs of the body are acting physiologically those elements of tissue-waste which, retained in the body, favor the development of eclamp-

sia, are excreted. When skin, bowels, and kidneys are clogged, the reverse holds true, and sooner or later, in pregnancy, symptoms appear which, if not properly appreciated and when possible eradicated, are forerunners of eclampsia. When urinalysis reveals the presence of kidney disease—whether organic or functional—steps should be taken at once to modify the symptomatology for the better by recourse to hygiene and dietetics, and, such measures failing, after reasonable interval medicinal and surgical treatment enter the foreground.

Chief among the hygienic measures stand hot baths and gentle catharsis; foremost among the dietetic measures ranks milk diet (associated with the administration of an assimilable and non-astringent form of iron).

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The prophylactic treatment consists in a milk diet from 2½ to 3 litres per diem and some alkaline mineral water, such as Vichy, and the careful regulation of the bowels. Chloroform should be administered during attacks; but chloral-hydrate per rectum is preferred as the usual sedative. It is given in the following form: Milk, 1 ounce; the yolk of an egg; and chloral-hydrate, 45 grains. The addition of the milk and egg is necessary, as otherwise the chloral would irritate the rectum, and the enema would not be retained. Brindeau (*L'Union Méd.*; *Liverpool Medico-Chir. Jour.*, Jan., '96).

Milk treatment is most efficient from a prophylactic point of view, though it does not necessarily cause the other alarming symptoms, besides the fits, to vanish. The alleged disappearance of albuminuria does not necessarily occur, even after prolonged treatment by milk diet. The same may be said of the œdema; this treatment seems to have no effect on it. The above facts are emphasized, because some obstetricians have very naturally given up milk diet on account of persistence of albuminuria

and œdema. Such a step is a mistake, for, if the treatment be continued, labor will proceed without any fits coming on, though the legs remain swelled and the urine albuminous. Ferré (*L'Obstétrique*, Nov. 15, '96).

Where, notwithstanding these measures, the evidences of organic kidney disease become intensified, or where, these evidences lacking, the symptoms suggestive of impending eclampsia develop, time for action has come, justifiable delay having reached its limit. In the past and even to-day expectancy has been and is too often the cause of untoward results.

With the exception of the fulminating type of eclampsia—where art almost always fails, it may be stated that prompt action, of the nature to be described, will, in the vast proportion of cases, prevent the development of eclampsia.

Medicinal Treatment.—In the presence of the prodromal symptoms of eclampsia, but little reliance can be placed on drugs. Where urinary insufficiency exists, indeed, it is very questionable if the routine administration of drugs do not harm. Certainly the potassium salts are very likely to irritate the kidneys. The ingestion of large amounts of water by mouth and repeated irrigation of the bowel with hot (110° F.) normal saline solution will accomplish more than any and all drugs together.

Unless the physician is sure of the form of kidney disease present, morphine had best not be used. Cases of parenchymatous and tubal nephritis bear morphine tolerably well, but the interstitial form does not. Tyson (*Gaillard's Med. Jour.*, Aug., '91).

In eclampsia following delivery the impaired function of the kidneys greatly increases the danger of poisoning by bichloride and carbolic lotions when used for intra-uterine injection. Frey (*Therap. Gaz.*, June, '91).

Control of the convulsions by chloroform inhalation may render subsequent fits more severe, and might then, in the perturbed state of the nervous system, give rise to what in surgery is called primary syncope. Caution should be observed in the administration of chloroform, as it may prove dangerous. Rémy (Rev. Méd. de l'Est, Jan., '91).

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All pregnant women with albuminuria being liable to eclampsia, the urine should always be carefully examined, and, if a trace of albumin be found, absolute and exclusive milk diet should be at once adopted. This is the preventive treatment *par excellence* of eclampsia. In cases where there is œdema without albuminuria it is advantageous, if not absolutely necessary, to prescribe a milk diet.

When eclampsia has set in, if the patient is strong, vigorous, and greatly cyanosed, from 9½ to 16 ounces of blood should be removed, chloral administered, and milk given by the mouth; if necessary, by means of the œsophageal sound.

The attacks themselves should be combated by chloroform inhalations, and diuresis favored by subcutaneous injections of artificial serum.

If the patient is more delicate, the symptoms of cyanosis but slightly marked, and the attacks less frequent, chloral only should be administered.

Whenever possible, we should wait until labor sets in spontaneously and allow delivery to terminate naturally.

If, labor being spontaneous, delivery does not terminate on account of too feeble or too slow uterine contractions, the forceps should be applied, or version, followed by extraction, if the child is living; by cephalotomy, basiotripsy, or cranioclasia, if the child is dead.

Intervention should be delayed until the condition of the maternal parts is such that no violence will be done to them, and therefore attended with no danger for the mother.

Induced labor should be reserved for exceptional cases.

Cæsarean operation and *accouchement*

forcé should not be considered as ordinary methods of treatment in eclampsia, but should only be resorted to in cases in which the death of the mother appears certain, and when all other measures have failed. Charpentier (Univ. Med. Jour., Oct., '96).

The treatment of eclampsia should be, in the first place, prophylactic. A careful examination of the urine at short intervals in the late months of pregnancy, together with a careful watch for the first evidence of toxæmia, should be the duty of everyone who undertakes the care of these cases. In the attack remarkable results have followed the use of morphine. It acts by promoting diaphoresis, as well as by lessening the excitability of the centres. It must be given in successive large doses until the patient is completely narcotized, in order to get its full effect. Olshausen argues that the lack of success with this drug is due to failure to employ sufficiently-large doses. Chloral must also be given in heroic doses. Chloroform, according to Vinay, has no effect whatever on the attacks unless given continuously for from six to eight hours. Veratrum viride is of great value in controlling the convulsions. Priskily-acting purgatives should be given as well as hot baths or hot packs.

Van Renssalaer suggests venesection, carried to the point of tolerance, and then followed by the subcutaneous injection of a normal salt solution. This method need not be confined to the plethoric, but even a weak pulse and profound coma do not contra-indicate its use, for the rapid introduction of the warm salt solution following venesection counteracts the effects of bleeding, filling the vessels and stimulating the heart. From a pint to a quart of blood can be safely withdrawn from the veins of a patient of average weight, providing the injection of the salt solution is followed up at once. J. L. Rothrock (North-western Lancet, Nov. 15, '97).

The saline irrigation—if a number of quarts are used at a time—promotes diuresis and diaphoresis and indirectly enforces intestinal peristalsis, and such irri-

gation should become the established custom not alone in face of impending eclampsia, but also in the presence of eclampsia. Where the pulse of tension exists venesection—too seldom resorted to nowadays—is called for.

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Patients with eclampsia are never able to sit while venesection is performed, consequently a larger quantity of blood is required to produce the desired results than if the sitting posture could be assumed. It is much better not to bleed at all than to bleed inefficiently. While the loss of a small amount of blood will do no harm, it can do no good, and therefore it probably brings the very best life-saving remedy in eclampsia into disfavor and ill repute. J. T. McShane (Indiana Med. Jour., Jan., '96).

Bleeding, followed by the subcutaneous or endovenous injection of normal saline solution, has much to recommend it. The speedy evacuation of the uterus constitutes the most important means of treating eclampsia. Mangiagalli (Annali di Ostet. e Ginecol., Sept., '96).

Saline transfusion should be resorted to if the patient is in a collapse and death seems imminent. These hypodermic injections of warm sterilized water, salt (1 per cent.) to the amount of one-half pint, into the vascular tissues of the axillæ will be readily absorbed. G. Covert (Chicago Med. Times, Apr., '98).

Possibly veratrum viride administered hypodermically every two or three hours in the dosage of 10 minims, until the pulse-rate is materially lowered (down to 60 or 40) will accomplish the same result as venesection, and at times the free use of this drug will render unnecessary resort to active surgery, except where the symptoms are very urgent, when we are amply satisfied that dallying with drugs should cease.

Veratrum viride should not be given hypodermically, but by the mouth, as the stomach will reject an overdose. W.

J. Chandler (N. Y. Med. Jour., Nov. 23, '95).

After the administration of veratrum viride, the urinary secretion becomes copious and the patient immediately improves. C. C. Barrows (N. Y. Med. Jour., Nov. 23, '95).

Twenty-six cases with no deaths treated with veratrum viride by the mouth or subcutaneously until pulse had been lowered below 60 and convulsions controlled, after which the following mixture given:—

R̄ Acidi benzoici, 2 drachms.
Potass. bicarb., ½ ounce.
Spirit. æther. nit., 1 ounce.
Spirit. Mindereri, 2 ounces.
Syr. limonis, q. s. ad 6 ounces.

M. Sig.: A teaspoonful every four hours. R. C. Newton (N. Y. Med. Jour., Dec. 14, '95).

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Ordinarily the initial dose of veratrum viride should be at least 10 drops, and repeated within an hour. If powerful sedation is not obtained, and the pulse brought down to 60 or less to the minute, morphine may be combined if it is especially indicated. After labor is completed, and convulsions under control, chloral and bromide are given and from 3 to 5 drops of veratrum—often enough to hold the pulse at about 60 for two or three days, with salines to keep bowels open and flow of urine free. Rogers (N. Y. State Med. Rep., Jan., '96).

Excellent results following the administration of veratrum viride. Drs. J. Sellers and C. B. Mulvey (Indiana Med. Jour., Mar., '96).

The method by which veratrum viride is supposed to do good in cases of puerperal eclampsia is a double one. Chiefly from the action of its alkaloid, jervine, it powerfully depresses the circulation, and so bleeds the woman into her own vessels, relieving by this means congestion of the cerebral and spinal vessels and reducing in all probability any spasm of the renal blood-vessels which may be present, thereby causing marked increase in the flow of urine. In addition to this action, jervine also acts as a

powerful sedative to the motor tracts of the spinal cord, and so directly quiets nervous excitation, while the copious sweating which often follows its administration aids in relieving the blood of impurities, the kidneys of congestion, and relaxes the peripheral blood-vessels. Editorial (Therap. Gaz., Mar. 16, '96).

Veratrum viride used with marked success. The remedy notably diminishes the frequency of the pulse, and convulsions rarely occur when the pulse is kept at or below 60. Of 100 patients treated by veratrum viride in the writer's practice, 92 were saved. Parvin (Universal Med. Jour., Oct., '96).

Norwood's tincture of veratrum viride, 10 to 20 minims, preferably by hypodermic injection, can be safely followed, in from thirty minutes to an hour, if necessary, by a dose of from 5 to 8 minims. Bauer (Med. Rec., Nov. 21, '96).

Successful treatment of puerperal eclampsia by veratrum viride reported. J. B. Shober (Amer. Jour. of Obst., June, '97).

The toxins causing uræmia are varied and numerous. In eclampsies the urine is less toxic than normal, while the blood-serum is more toxic. The fœtus is an additional source of waste-products and an additional cause of danger to the mother. The indications for treatment are to remove the toxic materials in every way practicable. Veratrum viride in cases where the pulse is strong enough to warrant its employment will be found useful. The depressing action of pilocarpine makes it a dangerous drug. Many patients with eclampsia die from over-medication. Labor should be induced or delivery hastened when other methods fail to control the convulsions. P. W. Van Peyma (N. Y. Med. Jour., Feb. 22, '96).

Treatment is preventive and curative. Milk diet and distilled water should be given in the pre-eclamptic state to dilute the poison, hasten its elimination, and nourish the patient. Blood-letting should be employed only in plethora or cyanosis. Nitroglycerin diminishes vasomotor spasm; hence it may be given freely in appropriate cases. Veratrum viride is a cardiac depressant and a dan-

gerous remedy if pushed to an extent that will control convulsions. As a primal measure the uterus should be speedily emptied of its contents. W. W. Potter (Amer. Jour. Obst., Nov., '97).

We have in veratrum viride an agent the physiological properties of which meet the supposed pathological conditions in puerperal eclampsia, namely: increased arterial tension and cerebrospinal excitement. John Gordon (Lancet, Jan. 15, '93).

Guaiacol used in two cases with "surprising and happy" results. Forty or 50 drops were poured upon the abdomen and gently rubbed in. In a few minutes the pulse became soft, free diaphoresis set in, and the convulsions died away. In both instances there was albuminuria and œdema, and in both the recovery was good. Its physiological effect is to cause rapid and marked lessening of arterial blood-pressure, lowering of temperature, and free diaphoresis. Appleby (Boston Med. and Surg. Jour., Mar. 18, '97).

Nitroglycerin, in the dosage of $\frac{1}{16}$ grain, hypodermically, repeated *pro re nata* will tend to relieve the cephalalgia. When the convulsions appear suddenly morphine, 1 grain hypodermically, is called for until chloroform anæsthesia to the surgical degree is secured; but otherwise opium and its derivatives should not be countenanced, because of their tendency to inhibit secretion from the intestinal canal and from the kidneys, thus defeating the prime therapeutic aim, which is to increase secretion and excretion.

These few drugs failing to control the premonitory symptoms or eclampsia suddenly developing, measures of a surgical nature are called for.

Surgical Treatment. — Where the symptoms which forebode the development of eclampsia do not yield to the dietetic, hygienic, and medicinal treatment outlined, the surgical measure demanded is evacuation of the uterus.

In eclampsia occurring during parturition delivery should be effected as quickly as possible under deep anaesthesia. When possible, without loss of time, the cervix should be widened by hydrostatic dilators, and the smallest possible incision. When the condition of the cervix is the cause of delay after artificial dilatation, incision as deep as may be necessary should be made. Hæmorrhage arising from this cause may be controlled by tampons of gauze or by pressure-forceps. In such cases, considering the amount of hæmorrhage from the incision, there can never be any question of adopting venesection. When the patient is unconscious, no attempt should be made to make her swallow; a suitable stomach-pump should be invariably used for the introduction of nourishment or medicine. Anaesthetics should be used to the surgical extent only during the operation of emptying the uterus, and either chloroform or ether may be used. The most exact asepsis is required; infection prolongs the convulsion stage of eclampsia. P. Zweifel (Centralb. f. Gynäk., Nos. 46 to 48, '95).

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In the Prague hospital the rule is to deliver as rapidly as possible consistent with avoiding injury. A mixture of chloroform, ether, and alcohol is an especially safe preparation, the anaesthetic being administered not only during the operative proceedings, but also to modify the convulsions. Morphine is also constantly employed. The prolonged warm bath and the hot wet pack are very important. The only beverage permitted is lukewarm milk. Knapp (Monats. f. Geburts. u. Gynäk., B. 3. May and June, '96).

Albuminuria is a premonitory sign too important to be overlooked. Termination of the delivery is in all cases desirable, and it *must* be rapidly brought about in serious cases. Therefore from the beginning of the attacks we must act continuously in that direction. In very urgent circumstances we must not hesitate to dilate the cervix. If this *accouchement forcé* is difficult, too slow,

or impossible without too much injury, we must have recourse to Cæsarean section. N. Charles (Jour. d'Accouchements, Oct. 11, '96).

In puerperal eclampsia the chief aim is to empty the uterus of its contents as quickly as possible. The cervical canal should be dilated, first by means of Hegar's graduated sounds and afterward with the fingers, until the orifice has attained a diameter of three centimetres. Podalic version, according to the Braxton-Hicks method, is then practiced and one foot extracted. This done, the uterine orifice is again dilated by separating its edges on one side by means of the child's leg, upon which the hand of the operator exerts (the foot being already extracted from the wound) energetic lateral pressure, and on the opposite side with the hooked index of the other hand. When dilatation of from eight to ten centimetres has thus been obtained, it only remains to extract the child. As soon as the umbilical cord has been severed the placenta should be detached and the uterus compressed with the two hands for about an hour; this compression suscitates the uterine contractions, preventing any serious hæmorrhage. Drejer (La Semaine Méd., Oct. 31, '96).

Acceleration of labor by safe methods, large doses of morphine to suppress the attacks, avoidance of administering medicine by the mouth, stimulation of diaphoresis by external remedies—all these appear to promise most success in treatment. J. Veit (Festschrift f. Carl Ruge, '96).

Whenever albumin is discovered in the urine of a pregnant woman, she should, without delay, be put upon a strict milk diet, for albuminuria is to be regarded as a symptom of the state of auto-intoxication which results in eclampsia. Tarnier says that he has never seen eclampsia supervene in pregnant women suffering from albuminuria who have been for seven days upon a strict milk diet. During the convulsions the tongue is best preserved from injury by placing a folded handkerchief between the teeth, which pushes the tongue back, and also prevents the teeth from closing. The pa-

tient should be placed immediately under the influence of chloroform. A rectal injection of about 60 grains of chloral should next be given; it is advisable to begin with a large dose rather than repeated small doses. If necessary the injection of chloral may be repeated several times, giving as much as 250 to 300 grains in twenty-four hours. The inhalation of chloroform should be continued during the attacks. Bleeding is reserved for the rare cases which are distinctly "sthenic" in type. As a diuretic agent, half a pint or more of a saline solution containing 1 per cent. of chloride of sodium, may be injected into the buttock, and the injection repeated several times. No interference is required until the cervix is fully dilated, when the child may be extracted with forceps or by turning. Delivery by such forcible methods as rapid dilatation or incision of the cervix is condemned. OUI (L'Echo Méd. du Nord, May, '97).

The treatment consists in controlling the convulsions by *profound narcosis*, speedy evacuation of the uterine contents, and diaphoresis, with a view to re-establish skin function and reduce the tension. Kedarnath Dass (Indian Med. Rec., Apr. 16, '98).

The nearer the term, the easier the procedure of emptying the uterus; the same statement applies to the multipara over the primipara. The steps of the procedure are, in brief, the following: Under the most absolute asepsis of patient, instruments, and hands of operator and assistants, ordinarily under chloroform anæsthesia, the cervix is dilated by the steel-branched or other dilator. Great care is requisite not to rupture the membranes. The cervical canal is then firmly packed with sterile gauze, and the upper portion of the vagina as well. The woman is put to bed and if she complain of much pain codeine should be used freely in suppository (gr. ii to iv repeated every four to six hours), for reflex nervous irritability must be controlled. At the expiration of about twenty-four

hours, under absolute asepsis and chloroform anæsthesia, the gauze is removed, and, if the cervix has softened and is dilatable, manual dilatation is resorted to. If the cervix has not softened and the symptoms are not urgent the canal should be repacked for a further period of about twenty-four hours. Dilatation by the hand having been accomplished to the requisite degree—that is to say, until the closed fist can be withdrawn with ease, the membranes being intact, elective version is performed, followed by immediate extraction, else the lower uterine segment may close on the foetal head. When the membranes have ruptured delivery from the brim by axis-traction forceps is indicated. After delivery—when the pulse is full, strong, bounding—uterine venesection is allowable until the pulse becomes soft. Where, on the other hand, the pulse after delivery is rapid and weak, no time should be lost in the thorough uterine tamponade.

Where eclampsia develops without premonitory symptoms, or where delay with the premonitory symptoms has ruled, there is no time for the preliminary tamponade. Under absolute asepsis and chloroform anæsthesia manual dilatation is at once instituted, associated, in very rare instances, with the Dührssen incisions, the uterus being then emptied.

In post-partum eclampsia there is no scope for surgery, and dependence must rest on drugs (veratrum and the nitrites), on repeated high saline rectal irrigation, and in free catharsis, using elaterium or croton-oil. Whether the case be of the sthenic or asthenic type, these rules hold good, except that in the latter type hypodermoclysis of saline solution should be added, and in the latter venesection.

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ECZEMA.—Gr., *ἐκζεῖν*, to boil over.

Definition.—Eczema may either be an acute, subacute, or chronic inflammatory disease of the skin, usually characterized in its earliest stages by the appearances of erythema, papules, vesicles, or pustules, or a combination of two or more of these lesions. It is attended with a variable degree of thickening and infiltration of the cutaneous tissues, terminating either in discharge with the formation of crusts or in absorption or in desquamation.

Varieties.—The primary, or elementary, varieties are the erythematous, papular, vesicular, and pustular; or the first outbreak may show a mixture of these several types. In many cases the beginning lesions or type soon lose their characters and the disease develops into the common clinical varieties: eczema rubrum or eczema squamosum. Other clinical or secondary types met with are eczema fissum, eczema sclerosum, and eczema verrucosum.

Symptoms.—The *erythematous* type of eczema—also called eczema erythematosum—is most frequently seen upon the face, although it may make its appearance upon any other region or may be more or less general. It begins as a single hyperæmic area, or several areas may appear simultaneously, usually upon one region. The areas may be small or large, irregularly outlined, ill defined, and attended with slight or considerable swelling and even œdema. There is more or less itching and burning. The eruption soon becomes pronounced, the parts reddened, somewhat thickened, and here and there a little scaly. There may also be, here and there (as a result of rubbing or scratching, or spontaneously) a tendency to serous oozing. The affected skin is harsh, dry, and reddish or violaceous in color. It often persists in this form, and the skin may

become considerably thickened and infiltrated. The swelling and œdema which are often first present may subside, to a great extent at least, or these symptoms may reappear from time to time whenever there is an acute exacerbation. The parts may become quite scaly, and constitute a mild or well-marked scaly eczema: eczema squamosum. Occasionally, as a result of constant irritation, rubbing, and scratching, or from other causes, the parts become moist, markedly inflamed, with more or less crusting, constituting eczema rubrum.

The *papular* type of the disease, or eczema papulosum, presents itself as one or more aggregations of closely-set papules, pin-point to pin-head, or slightly larger, in size. The disease may also show itself as more or less discrete papules, with here and there aggregations. In color the lesions are bright- or deep- red or violaceous, with often a few vesicles or pustules interspersed. Itching is usually intense. The extremities, and the parts, especially about the joints, are its favorite sites. The course of this type is essentially chronic, some lesions disappearing and others appearing, and thus persisting for several months or indefinitely. In some instances, especially in some areas, the papules become so thickly crowded that a solid patch results, becoming more or less scaly—eczema squamosum. Or at times such a patch may develop into eczema rubrum.

The *vesicular* type of the disease, or eczema vesiculosum, may show itself on one or more regions, and consists of aggregated or closely-crowded pin-point to pea-sized vesicles, with here and there discrete lesions, and at times with papules and pustules interspersed. It is usually a markedly-inflammatory type, with considerable œdema and swelling.

Solid sheets of eruption may form. The vesicles usually rupture in the course of a few hours or days, new outbreaks occurring, or a raw weeping, more or less crusted surface resulting. The oozing may be continuous or the process may decline, to remain quiescent or to break forth rapidly with repeated vesicular crops. Considerable thickening may take place and with the oozing and crusting make up a picture of the common clinical type: *eczema rubrum*. The face and scalp of infants, the neck, flexor surfaces and fingers are the more common sites for the vesicular type. Its course is usually chronic, with several acute exacerbations, or, as already described, it may pass sooner or later into the common clinical type: *eczema rubrum*.

The *pustular* variety of eczema, or *eczema pustulosum* or *impetiginosum*, is less frequently met with than the other varieties of the disease. Its common site is the scalp, especially in infants. It may develop from the vesicular variety, or, as more commonly the case, begin as closely-set pin-point to pin-head, or larger sized pustules; or a mixture of vesicles and pustules may be noticed. In symptomatology it is similar to *eczema vesiculosum*, except that the lesions, instead of containing serum, contain pus. As in the vesicular type, the same disposition to the rupture of the pustules is observed, and there is often a tendency to develop into the type known as *eczema rubrum*. More or less crusting is usually a conspicuous feature. The ill-nourished and strumous persons are its most common subjects. The type is essentially chronic.

The *squamous* type of eczema, or *eczema squamosum*, is a clinical variety frequently met with, characterized by redness, infiltration, and more or less scaliness, with, especially when about the

joints, more or less fissuring. The itching is variable, sometimes intense, and at other times slight. This variety is usually a development from the erythematous or papular types, and, like other types of the disease, is persistent and chronic.

Eczema rubrum, the oozing type of eczema, or somewhat dry, raw-looking type of eczema, usually results from a pre-existing vesicular or pustular eczema. It is characterized by a red, weeping, oozing, raw-looking surface, with more or less infiltration of the cutaneous tissues. In some cases there is a combination of weeping raw surface with crusted areas. In other cases the weeping nature of the disease is a conspicuous feature, crusting scarcely having time to form: *eczema madidans*. Its most frequent sites are the face and scalp of children and the legs of adults; in the latter in those especially advancing in years. In these cases of eczema of the lower legs varicose veins are often present as a precursory and concomitant condition. It is essentially chronic, showing little, if any, disposition to disappear spontaneously, although it may be somewhat variable. The degree of inflammation varies from time to time.

The *fissured* type of eczema, or *eczema fissum* or *eczema rimosum*, is that type of eczema in which cracking or fissuring of the skin is the most conspicuous feature. It is common about the joints, especially about the fingers, and in most cases is a part of an apparently slight erythematous eczema. Fissuring may occur in any type of the disease, especially when about the joints; but in most cases it is but slight in character. It is a persistent type of the disease, usually disappearing in part or more or less completely in warm weather. A somewhat analogous or allied variety of eczema is the so-called

crackled eczema. This is usually a mild subacute erythematous eczema, involving large regions or the entire surface, numerous superficial cracks through the upper epiderm showing over the fissured surface.

Eczema sclerosum and *eczema verrucosum* are somewhat rare varieties of the disease. These types are usually seen about the ankles, lower leg, or feet. They commonly result from a pre-existing papular eczema. In many respects these types are analogous in their symptomatology: there is considerable thickening and board-like hardness, with, as a rule, much infiltration, but with the inflammatory element slight or comparatively so. The surface is rough, hard, and somewhat horny to the feel, and in the verrucous variety there is added to these several symptoms a variable degree of papillary hypertrophy, the surface having a distinctly-warty appearance. Both types are essentially chronic and rebellious to treatment, demanding the strongest application.

Infantile Eczema.—The disease is common in infants and young children. It is unusual, comparatively speaking, in children past the age of 6. Even in those cases in which the disease begins in the first or second year and is persistent, it tends to decline spontaneously toward the age of 5 or 6, or even earlier; or at least at this period it will usually respond rapidly to any mild or indifferent application. The disease presents no special characteristics in the young, except that in the majority of such cases the inflammatory element is apt to be more marked. In by far the larger proportion of cases the face or the face and scalp are the seat of the disease; eczema of the region of the genitalia and anal cleft is also not infrequent.

All cases of infantile eczema will

usually do well under treatment, although a disposition in many cases is shown toward relapse till the age of 4 to 6 is reached.

In eczema in infants and young children occurring about the legs and arms, usually as a vesico-papular or papular eruption, discrete and patchy, the disease is often obstinate,—much more so, as a rule, than in those cases where the disease is limited to the face or face and scalp. The vesicular, vesicular-papular, and moist or crusted inflammatory type—*eczema rubrum*—seem most frequent in the young.

Regional Eczema.—It is usual to describe eczema as it appears upon different regions, as, for instance, the hands, face, scrotum, legs, etc.; but the disease in reality differs little, certainly not materially, as it occurs upon different parts. The description of the several types of the disease as already given suffices.

It is noted that the most common seats for eczema in those of the active age, between 21 and 50, is about the hands, less frequently about the face or the scalp; the scrotum is not an uncommon site, and also the anal region.

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There is a remarkably-obstinate form of chronic eczema, which attacks the palms, and, though more rarely, the soles sometimes also. The disease commonly takes its origin in the centre of one palm, though it is generally not long until both are implicated. There are hard, scaly patches of infiltrated skin, involving more or less of the surface; there is ragged and uneven scaling, while in the natural lines of flexion, or independent of these, are deep and painful cracks. The hands feel hot, and burn and itch at times. This morbid condition advances sometimes along the fingers toward their tips, the pulp remaining, as a rule, immune. A symptom observed in the feet which is not so evi-

dent on the palms is the existence of a band of congestion beyond the scaly area, fading imperceptibly into the natural tint of sound skin. Though met with in both sexes, this variety of eczema is most commonly encountered in women, and in them about the menopause. Jamieson (*Edinburgh Med. Jour.*, Jan., '98).

In a recent analysis of 10,000 miscellaneous skin cases in the writer's private practice, 32.01 per cent. suffered with eczema. Neurotic eczema is frequently observed in infancy in connection with cutting of the teeth; in childhood it is less common; its most frequent time of occurrence is between 20 and 55 years of age. Various forms or phases of nerve disturbance are seen in connection with neurotic eczema, and they may be considered under the following heads: (1) neurasthenia, or nerve-exhaustion; (2) nervous and mental shock; (3) reflex phenomena (*a*) of internal origin or (*b*) peripheral; (4) neuroses, (*a*) structural or (*b*) functional.

The eruption is apt to come first upon the hands and face, less commonly on the feet. But from its starting-point it may extend over large surfaces. Neurotic eczema upon the hands is very apt to exhibit vesicles; but on the adult face the eruption is quite as likely to assume and maintain the erythematous form, with vesicles, and often without moisture, unless scratched. The groups of lesions have a tendency to be pretty sharply defined, in more or less herpetic patches, which may present mainly solid papules, or, when torn, a raw surface. It is intensely itchy, and the spasms of itching are sometimes fearful and utterly uncontrollable. L. Duncan Bulkley (*Jour. Amer. Med. Assoc.*, Apr. 16, '98).

In those past the age of 50 the most common site is the lower leg, although eczema of the face is not infrequently met with.

General Symptomatology.—The subjective symptoms in eczema are itching, burning, and a sensation of heat. These may be severally present, or, as is more

commonly the case, one is predominant. The degree varies, sometimes slight and at other times almost unbearable. As a rule, there are no constitutional symptoms so-called in eczema cases. In extensive general acute eczema there may be slight febrile action and sometimes slight chilliness at the outbreak of the attack. The degree of inflammatory actions varies in the same case from time to time and in different cases. The disease may be acute both in type and its course, running to an end in several weeks or one or two months. As a rule, however, whatever the type of the inflammatory process—acute, subacute, or chronic—the disease is persistent and long-continued, with, in most cases, little, if any, tendency to disappear spontaneously. Seasons often have an influence, the disease usually being less active or partly or completely disappearing in the summer weather. On the other hand, there are cases of the disease met with that are at their worst in summer time, and frequently disappear in the colder weather; such instances are, however, exceptional.

Etiology.—The consensus of opinion points to both external and constitutional causes as active factors in most cases of the disease. The possibility and even probability of this disease's being due to a parasite is more or less seriously entertained in some quarters.

A large proportion of the cases of eczema are due to parasites. On the other hand, a large number depend on some condition inside the body. Some, again, are due to internal conditions with a local factor added. Elliott (*Jour. Cutan. and Genito-Urin. Dis.*, Dec., '95).

Cause of seborrhœic eczema considered as microbic, the serpiginous character of the eruption, its want of resemblance to other forms of dermatitis (chemical and mechanical), and the effect of parasitocidal therapeusis all tend-

ing to confirm this view. Unna (Volkmann's Sammlung klin. Vorträge, Sept., '93).

No doubt all kinds of micro-organisms can be found on eczemic patches, but so they can on the normal skin, and it has yet to be proved that they are instrumental in its production. Hartzell (Jour. of Cutan. and Genito-Urin. Dis., Dec., '95).

Eczema depends on a great many conditions, both constitutional and local. It can result from heat or chemical agents, and persist after the irritant ceases. In some cases it may be purely a parasitic affection, but it is probably a constitutional affection with the parasitic element superadded. Fordyce (Jour. Cutan. and Genito-Urin. Dis., Dec., '95).

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Seborrhœic eczema is caused by a specific germ or germs, diplococci, whose life-history is most active at the ordinary temperature and with free access to the air, but which can develop at much higher and lower temperatures and with a scarcity of oxygen. William H. Merrill (N. Y. Med. Jour., Mar. 6, '97).

Case of so-called seborrhœic eczema observed occurring in a young man, upon a cicatrix the result of a burn in infancy. The occurrence upon a surface where the sebaceous and sudoriparous glands had been destroyed for years is strongly corroborative of the opinion held by the author, that the affection known as seborrhœic eczema is neither a seborrhœa nor an eczema. As the result of experiments made with this case, he concludes that so-called seborrhœic eczema is autoinoculable. Audry (Annales de Dermat. et de Syphil., No. 5, '97).

Among the constitutional influences which are or seem to be of some importance as predisposing or active factors are gout, rheumatism, disorders of digestion or assimilation, dentition, struma, general debility, and loss of nervous tone.

The chief elements of causation in the eczema of elderly people seem to be a debility of tissue and a faulty kidney-

action. The urine is scanty and of high specific gravity, and often loaded with urates. Sugar is not uncommon. Deficient bowel-action is likewise common. These facts give a basis for treatment. Local measures will not be successful if these points are not carefully attended to. Bulkley (Trans. Med. Soc., State of N. Y., '90).

Immoderate habits in the use of certain foods, drinks, and drugs also indirectly or directly have an influence, such as alcoholic drinks, narcotic drugs, and excessive tea- or coffee- drinking.

Two cases of eczematous erythema observed consequent upon applications of salol. Cartaz (Jour. of Larynx, Jan., '92).

Overwork, especially of a mental character, in those of hereditary eczematous tendency will often be provocative of an attack. That the hereditary disposition to the disease exists in many families cannot be denied.

Proof is abundant and convincing that the tendency to eczema may be hereditary. It may prevail in several persons in the same family, and may occur with greater severity in successive generations. The laws under which it is transmitted appear to be the same as those of other heritable diseases. The eczema of infants has nothing whatever to do with the child's health. The infant is usually quite well up to the time of its commencement, and excepting in so far that the dermatitis may interfere with its comfort and rest it remains so throughout. The dermatitis when at its height is due to the existence of some contagious material which has in some way been generated, and it is only in a very feeble sense of the words a constitutional malady. Individual peculiarities in the organization of the skin are the fundamental predisposing cause. That there is any one microbe which is the cause of the eczematous process in general appears, in the light of clinical facts, improbable in the highest degree. Hutchinson (Clin. Jour., vi, 275, '95).

Among the external exciting factors

may be mentioned cold and heat, especially the former; sharp, biting winds; and too liberal use of certain soaps; the handling of dyestuffs, chemical irritants, and the like; vaccination, and exposure to certain plants. Having the hands frequently in water, as with washerwomen, the handling of sugar and flour, and repeated antiseptic cleansing of the hands often bring about the various conditions of eczema of these parts known respectively under the names of washerwomen's itch, baker's itch, and grocer's itch, and surgeon's eczema. So far as known the disease does not possess contagious properties, and in a disease so frequent as this if such existed it would have been clearly demonstrated.

In some cases of markedly inflammatory eczema, especially when of the pustular type, swelling of the neighboring lymphatic glands is noticed, but this rarely leads to suppurative change, the swelling and pain disappearing as soon as the inflammatory symptoms have abated. In some cases of eczema a condition of furunculosis is occasionally observed.

Pathological Anatomy.—Eczema is essentially a catarrhal inflammation of the skin, and is seated chiefly in the rete and papillary layer; in long-continued and severe cases the lower part of the corium and even the subcutaneous tissue may be more or less involved, but never destructively. Hyperæmia and exudation are to be found in all cases, either as punctate, localized, or more or less diffused. The vascular changes are the same as observed in all inflammations.

Diagnosis.—Eczema is to be distinguished chiefly from erysipelas, psoriasis, seborrhœa, sycosis, scabies, and ring-worm.

ERYSIPELAS.—Markedly acute eczema

about the face sometimes presents early in the course of the attack a resemblance to erysipelas, but in the latter disease the border is sharply defined and elevated; it usually starts from one point and spreads rapidly, and is accompanied by systemic symptoms of more or less violence.

PSORIASIS as commonly met with is not difficult to differentiate. The numerous, variously-sized, sharply-defined scaly patches, of general distribution, of psoriasis make this disease sufficiently characteristic. The face and hands are rarely involved, or only to a slight extent, at least, in psoriasis, while these regions are favorite sites for eczema. The psoriatic eruption often is seen most markedly on the extensors of the arms and legs, especially about the elbows and knees; eczema is more common in the flexures. Psoriasis is usually markedly scaly, eczema rarely so. In occasional instances psoriasis is limited to the scalp, appearing here as several or numerous variously-sized scaly areas, resembling squamous eczema of this part. The same differential characters can be here recognized, if the case is studied, as when seated upon other parts. Moreover, a careful examination will usually disclose the presence of several small or moderately sized characteristic psoriatic patches on the limbs, especially about the elbows and knees. Eczema of the scaly type is usually seated upon one region, is rarely generalized in its distribution, and the area or areas are rarely sharply defined. Itching is the rule in eczema and is often absent or slight in psoriasis. In many cases of chronic scaly eczema there is often a history of gummy oozing which does not obtain in psoriasis. The eruption produced in the parasitic disease scabies and pediculosis is essentially eczematous in many of its characters, but is usually multiform, consist-

ing of papules and pustules, the latter often being large in size. The distribution of the eruption in these parasitic diseases will often be sufficiently characteristic, and suspicion may be confirmed by the finding of the pediculus in pediculosis or by the burrow in scabies. Seborrhoea at times bears close resemblance to a mild eczema, more especially as it occurs on the scalp. The seborrhoeic disease is, however, rarely inflammatory, except accidentally so; the scales are greasy, and there is lack of infiltration and thickening.

SYCOSIS.—Eczema of the bearded face may be mistaken for sycosis, but this latter disease is essentially one of the hair-follicles — folliculitis barbæ — and limited to the hairy region of the face, and is rarely itchy. Eczema, on the other hand, is seldom limited to this region, but extends on to the non-hairy parts of the face, is not follicular, and is very itchy. Ringworm can scarcely be confounded with eczema, as eczema is seldom sharply defined, rarely ring-shaped, but is diffused, with no tendency to clear up in the centre. In cases of a doubtful character microscopical examination of the scales will be sure to differentiate.

DERMATITIS. — Dermatitis is sometimes with difficulty distinguished from eczema, as the symptoms of mild dermatitis are essentially the same as those of eczema; in fact, these cases may be looked upon as artificial eczemas. Eczema rarely, if ever, shows large vesicle- or bleb-formation as found in the severe types of dermatitis, more particularly from rhus. The history of the case will often throw light upon the diagnosis. In those eczematously inclined, however, what may be a true artificial dermatitis in the beginning may terminate in a veritable stubborn eczema.

Among other diseases that should not be confounded may be mentioned rosacea, erythema, urticaria, herpes zoster, lichen planus, lichen ruber, and impetigo contagiosa.

Prognosis.—Eczema, while often most intractable, cannot be said to be incurable. It may recur like any other disease to which a person may be prone. Under favorable circumstances mild cases yield quite readily. During the course of treatment the disease may show slight relapses, but each succeeding one is usually noted to be of a milder and less obstinate character. It is difficult, in the individual case, to state an opinion, especially as to the duration of treatment. Several factors should influence the prognosis: the extent involved, the duration, previous variability, the nature of the exciting and predisposing causes, and whether these can be readily managed, and, finally, and of great importance, the care and attention the patient gives to the carrying out of the treatment advised.

Treatment.—There has been great diversity of views as to the methods of treatment,—*e.g.*, as to whether it should be external or constitutional. The conservative course, and that which seems to give the best results, is that which places reliance upon conjoint local and systemic measures. It is not improbable that there are some cases met with which persist without any constitutional cause, or the latter has already disappeared, and in such instances external treatment alone will bring about permanent relief. There are certain general or hygienic measures which should receive attention. The diet should be plain, but nutritious, all fancy dishes and indigestible meats and foods being avoided as much as possible.

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It is very important to watch the digestive functions and the action of the kidneys in all forms of eczema. The diet is also very important, and in the majority of cases proper food is the most efficacious internal remedy. The diet should be based somewhat upon the diathesis of the patient, but it mainly consists in the prohibition of all alcoholic beverages save a small quantity of wine with a little water. Coffee and tea are diminished in quantity; fish, crabs, clams, and oysters may be given in preference to red meats. The patient is not allowed to take asparagus or cucumbers. Eggs, milk, and other light articles of diet are exceedingly useful. All fermented drinks are absolutely prohibited, and also all acid fruits. *Barrazzi* (*Revue de Thérap. Medico-Chir.*, June 1, '96).

Treatment includes both constitutional and local measures. The diet must always be carefully directed, and, for the purpose of furnishing best possible nerve-nutritment, an increase in the digestible fatty matter and phosphates should be ordered. Some caution may be required in regard to the former, but with a little care the amount of fat of meats and oils, and also fresh butter, can be added to the dietary. The phosphates are found abundantly in the preparations of whole wheat, such as crushed wheat, wheatena, wheatlets, wheat-germs, *Pettijohn's* breakfast-food, etc., as also in bread made from the whole wheat-flour, some of which should be taken, if possible, three times daily. Milk, however, if properly taken, proves of the most signal advantage. It should be taken warm, pure, and alone, one hour before each meal, and also at bed-time, if sufficient time has elapsed for the stomach to be perfectly empty, which is at least four hours after a hearty meal. This precludes the possibility of adding liquor or egg to the milk, and especially should there never be a cracker or anything else eaten with or near it. The indications for local treatment differ materially in different cases. *L. Duncan Bulkley* (*Jour. Amer. Med. Assoc.*, Apr. 16, '98).

Pork and salted meats, veal, pastries,

strong acids or acid fruits, gravies, cheese, sauces, condiments, etc., and the excessive drinking of tea or coffee are to be eschewed. Beer, wine, and spirits are also to be avoided.

Out-door life is to be commended in suitable weather, and exercise, especially systematic in character, are of great value.

As to constitutional remedies, it may be said that there are no specifics, although arsenic seems at times of special value in chronic, sluggish, papular, and erythemato-squamous types. Each case must be carefully studied, and the predisposing factor or factors, if possible, discovered, and the treatment suitable instituted. When the itching is so intense as to prevent sleep, recourse may be had to the bromides, phenacetin, chloral, sulphonal, trional, and the like; opiates are apt to cause aggravation.

Literature of '96-'97-'98.

In the attempt to get relief from the itching, which can seldom be obtained by local measures alone, the plan of treatment should be a soothing and protective one. Zinc ointment with 1 or 2 per cent. of carbolic acid or creasote, or with 5 to 10 per cent. of ichthyol, or tincture of camphor, is always a safe and generally beneficial dressing, but to be of service it should be kept thickly applied, spread on lint in most places, and bound on firmly. In the acutely inflamed, and especially in the erythematous forms of the eruption, there is nothing better than the well-known calamin and zinc lotion, freely sopped on many times in the day. In the erythematous eczema of the face a tannin ointment, $\frac{1}{2}$ to 1 drachm to the 8 drachms, with 2 per cent. of carbolic acid, is effective. The use of very hot water for a brief application, followed by an appropriate ointment, should never be forgotten. In old cases of eczema of the scrotum the effect of this treatment is sometimes very remarkable.

L. Duncan Bulkley (*Jour. Amer. Med. Assoc.*, Apr. 16, '98).

If pruritus is present an absolute milk diet must be ordered. No medicine should be given until the case has been under observation for some time, since there are few drugs which may not increase pruritus. The urine must be examined for uric acid, sugar, albumin, oxaluria, phosphaturia, and peptonuria, and the patient's organs and functions thoroughly overhauled. The most harmless cutaneous antispasmodics are asa-fœtida and musk in doses up to 30 grains, and valerian in various forms. Opium is generally contra-indicated, being itself a frequent cause of pruritus. For the insomnia, sulphonal or trional in doses up to 30 grains in twenty-four hours is much surer and generally well borne by the skin. Arsenic is useful in chronic cases, but does not suit acute cases or chronic during subacute exacerbations, with the exception of some varieties limited to the extremities or the head. In cases with a gouty diathesis, bicarbonate of sodium acts well. The dose must be moderate if given for a long time. Sulphur in small doses is very useful with young anæmic, "lymphatic," or tuberculous patients. It is contra-indicated in neurotic or cardiac cases, or when the eczema is recent and acute. It is best given as natural sulphur-waters. Besnier (*La Belgique Méd.*, May 6, '97).

Among the tonics that are often of value may be mentioned codliver-oil, hypophosphites, quinine, nux vomica, the vegetable bitters, iron, arsenic, and manganese. Arsenic should never be given in the acute type, or in any case in which the disease is of the spreading or active character. Among alkalies, especially useful in gouty and rheumatic cases, may be mentioned sodium salicylate, potassium bicarbonate, sodium bicarbonate, and the lithium salts.

Case of eczema of scalp in a man of rheumatic tendencies, rheumatism disappearing with appearance of eruption: cure by salicylic acid. C. E. Lockwood (*Universal Med. Jour.*, Apr., '95).

Among alteratives that occasionally are resorted to may be mentioned calomel, colchicum, arsenic, and potassium iodide. In some cases rather free action of the kidneys is desirable, and recourse may be usually had to potassium acetate, potassium citrate, and, in exceptional cases of more or less general eczema, to the oil of copaiba. Laxatives form a very important class in the treatment of this disease, as indigestion with more or less active constipation is often a striking symptom. The various salines, and aperient mineral waters, castor-oil, cascara sagrada, rhubarb, and aloes, and other vegetable cathartics are useful.

Eczema is probably an excretory inflammation; object of treatment to relieve skin by shifting the stress of elimination to sound organs; in gouty persons salines that act on the bowels and kidneys; dermatitis once started, however, becomes complicated by invasion of numerous micro-organisms; hence mild local applications, creolin ointment ($\frac{1}{2}$ drachm to 1 ounce of vaselin), or a weak creolin lotion ($\frac{1}{2}$ drachm to the pint of water) will suffice for a cure. David Walsh (*Med. Press and Circ.*, Oct. 23, '95).

In this class of cases the several digestives and bitter tonics are often prescribed with advantage, such as pepsin, pancreatin, papoid, muriatic acid and gentian, quassia, calisaya, and other bitter tonics.

External Treatment.—In the local management of eczematic cases soap and water must be used with judgment. In the acute and in many subacute cases these cleansing agents should be employed as infrequently as circumstances will permit.

Literature of '96-'97-'98.

Water sometimes not only delays the cure, but absolutely prevents cases from getting well. When it becomes necessary, an oily preparation containing a

few drops of carbolic acid is to be used. John Edwin Hays (Pediatrics, Apr. 15, '98).

In cleansing eczematous surfaces and removing secondary products plain water or soap and water should be avoided, if possible. If the former has to be employed it should be as hot as can be borne, and the surface over which it has been used should be dried quickly and thoroughly and the selected dressing immediately applied. All detergent fluids should be warmed before use. Olive- or cotton-seed oil will cleanse almost as well as soap and water, and, if the part is carefully wiped, but little greasiness remains. Or thin strained rice-milk cleanses well and is soothing to tender and acutely-inflamed surfaces. Before any line of local treatment can be begun all secondary products—crusts, scales, etc.—must be removed. This can be accomplished by saturating them with oil. W. M. Nelson (Mont. Med. Jour., Apr., '98).

Cleanliness may often be maintained by gently rubbing off with cold cream, petrolatum, or almond-oil. Even in such cases, however, occasional washing is necessary, both for the sake of cleanliness and in order to get rid of the products of the disease and to remove the messiness which has resulted from the applications. A remedial application should always be made immediately after washing has been employed. In some cases, especially those of a chronic and scaly and markedly-sluggish character the use of soap and water is resorted to frequently and has often a therapeutic value; indeed, in some such cases the green soap—*sapo viridis*—may be occasionally or frequently used with advantage.

Notwithstanding the nearly universal dictum of the harmfulness of water, the value of baths containing tar, or taken after the latter has been well painted over the affected regions, insisted upon. After this is effected Vene-

tian talc is to be copiously dusted all over and around the area. Lassar (Dermatol. Zeitschr., B. 2, H. 6, '95).

A current of steam of 104° to 122° F. directed to the affected parts of the skin in eczema removes crusts and scales, occasions increased scaling of the epidermis, favors the absorption of superficial and deeper infiltrations of the skin, diminishes or even entirely stops formation of pus on the surfaces deprived of epidermis, and at the same time produces increased regeneration of tissues where, on account of chronic processes, the conditions for healing are very unfavorable. A convenient apparatus consists of a thick copper cylinder containing two or three glasses, the bottom one being heated with an alcohol-lamp. On the top are two openings,—one for pouring in water (closed by means of a screw) and the other for a bent tube. According to the sensibility of the skin, the tube is kept three to five inches from it. The *séance* lasts fifteen to thirty minutes. A. Liberson (So. Russian Med. Gaz., Nos. 51, 52, '95).

Applications are to be made in eczema two or more times daily, and when possible the continuous application is to be advised.

In the selection of external remedies for a particular case common sense must be employed. In those cases in which the type of disease is acute or subacute mild remedies are to be used. In the milder erythematous variety dusting-powders of zinc oxide, talc, starch, and kaolin are soothing and beneficial; they may be used alone or immediately following the application of one of the washes named below. The conjoint use of black wash or boric-acid lotion with oxide-of-zinc ointment or any mild ointment may give beneficial results. Or the simple oxide-of-zinc ointment with 20 to 30 grains of boric acid or 3 to 5 grains of carbolic acid to the ounce may be used. A compound lotion of calamin and zinc oxide, like the following:—

℞ Calaminæ, 1 1/2 drachms.
 Zinci oxidi, 1 1/2 drachms.
 Glycerinæ, 10 minims.
 Acidi carbolici, 20 grains.
 Aquæ, 6 ounces.—M.

is valuable, and may be dubbed on the surface repeatedly or by means of linen or lint kept wet with it and closely applied to the diseased surfaces; or a boric-acid lotion with 1 or 2 drachms of carbolic acid to the pint, will be found beneficial, and especially applicable if the diseased surface is large; or a boric-acid solution (15 grains to the ounce) may be made of the above calamin-and-zinc lotion. A so-called salicylic-acid paste, with or without 5 to 10 grains of carbolic acid to the ounce, is often of great advantage:—

℞ Acidi salicylici, 10 grains.
 Amyli,
 Zinci oxidi, of each, 2 drachms.
 Petrolati, 4 drachms.

M. Make ointment.

Literature of '96-'97-'98.

In vulvar eczema only emollient preparations should be employed—bran-water, marshmallow or chamomile infusion; a little boric acid can be added to the boiled water and serve as a basis for these lesions. Following the lotion a cataplasm of corn-starch or potato-starch, made with hot boric water and applied cold, is indicated. Little compresses of tarlatan soaked in borated bran-water recommended, to be placed between the lesser lips of the vulva. The dressing ought to be renewed after each urination. During the day borated cotton should be applied to the parts.

As a curative to be applied during the intervals between acute attacks, the following is suggested:—

℞ Vaseline, 6 1/4 drachms.
 Oxide of zinc,
 Starch, of each, 1 1/4 drachms.
 Salicylic acid, 1 1/4 drachms.—M.

The parts must have been previously bathed with borated bran-water and dried with cotton. Lutaud (*Jour. de Méd. de Paris*, Jan. 12, '96).

The following recommended to allay pruritus in eczema of the scalp:—

℞ Acidi salicyl., 6 grains.
 Menthol, 12 grains.
 Ol. lini,
 Aq. calcis, of each, 1 ounce.

M. Sig.: For external use. Steinhardt (*Amer. Pract. and News*, Mar. 15, '98).

A small piece of buckskin placed between the ointment and the other part of the dressing greatly ameliorates the condition. Its good effects are ascribed to the flexibility of the buckskin, which allows it to be molded to every part of the surface; to the ease with which it can be cleansed; to the fact that it does not markedly absorb the ointment used, and that therefore the part remains moist; and to the safety with which it can be removed, the newly-formed epidermis not being torn away. Davezac (*Jour. de Méd. de Bordeaux*, No. 51, '97).

An ointment of alumnol, 20 to 40 grains to the ounce of cold cream, or zinc-oxide ointment is also valuable. One containing 1/2 to 1 drachm of bismuth subnitrate is also of benefit. A compound calamin ointment may be used in some cases with great advantage:—

℞ Calamin, 1 drachm.
 Amyli, 1/2 drachm.
 Acidi salicylici, 10 grains.
 Ung. zinci oxidi, q. s. ad 1 ounce.
 —M.

Diachylon ointment, if a well-made one is procurable, is often serviceable. The soothing salve-mulls of zinc oxide and boric acid are extremely valuable in some cases.

In some cases of eczema in which the grade of inflammatory action is subacute, stronger applications may be resorted to,

although even in this class of cases it is advisable to begin the treatment with the milder applications already named. These latter may finally, if necessary, be made stronger and more stimulating by the addition of white precipitate, red precipitate, calomel, resorcin, or tar. Of the mercurials, 5 to 30 grains to the ounce is the usual proportion called for; of resorcin, 5 to 20 grains, and of tar, $\frac{1}{2}$ to 2 drachms of the tar ointment to the ounce of mild ointment. Oil of cade may also be used $\frac{1}{2}$ to 2 drachms to the ounce of ointment. A tarry ointment such as the following may also prove useful in these cases:—

R̄ Liquor carbonis detergens, $\frac{1}{2}$ to 2 drachms.

Cerat. simp., q. s. ad 1 ounce.

[Liquor carbonis detergens is made by mixing together 9 ounces of tincture of soap-bark and 4 ounces of coal-tar, allowing it to digest for eight days and then filtering. HENRY W. STELWAGON.]

Iodol-aristol, 5 to 20 or more grains to the ounce of ointment-base, may also be commended. In some instances preliminary paintings for several days with a saturated solution of picric acid has proved of advantage, waiting for the films or scale thus formed to come up, and then applying a mild ointment for a few days, and then resuming the picric-acid painting.

Literature of '96-'97-'98.

Picric acid is indicated in those forms of eczema in which the inflammation is acute and superficial, and where the lesions are mostly epidermic. The keratoplastic action of the remedy cannot display itself in the chronic forms accompanied by induration of the skin and particularly by epidermic thickening; picric acid is incapable of modifying these chronic lichenoid eczemas. On the other hand, the keratogenic properties

of the agent find an excellent field of action in acute eczemas with swelling of the integument, superficial ulceration, and weeping. Under its influence the inflammation rapidly subsides, and the acid forms (on contact with the ulcerated and oozing surfaces) a protective layer composed of coagulated proteid substances and of epithelial *débris*, under which healing takes place rapidly. Picric acid has the further advantage that it immediately stops itching; this effect is produced in chronic as well as acute forms of the disease. In acute eczema a cure is effected in from ten to fifteen days. Aubert (*Thèse de Paris*, No. 34, '97).

Picric acid successfully used in the treatment of eczema. In cases of lichenoid eczema with a thick epidermis the acid was useless, but in acute oozing eczema accompanied by oedema of the skin it was very useful. Immediate relief is produced by the application of the picric-acid solution. The treatment is indicated in acute eczema; in the acute attacks of chronic eczema, particularly if there is a tendency to oozing and ulceration of the skin, and in the seborrhœic eczema (impetiginous) of infancy. It is contra-indicated in chronic eczema and generally in all those forms of eczema which are accompanied by a thickening of the epidermis (lichenoid eczema).

The method of employment is as follows: A saturated solution of picric acid is painted on the affected parts, the application extending slightly beyond the limits of the eczematous area, then covered immediately with absorbent wool, or it may be with a compress soaked in the same solution, over which the wool is applied. This is allowed to remain on for about two days. The skin should be previously cleansed with some antiseptic, so that no suppurative organisms may be allowed to remain in contact with the diseased parts during the time they are covered with the wool dressing. The staining due to picric acid may subsequently be removed by washing in a saturated solution of lithia carbonate. M. A. Brousse (*Nouveau Montpellier Méd.*, Sept., '97).

In some instances applications of dressings of a more or less fixed character are of advantage, such as the gelatin dressing, tragacanth dressing, and acacia dressing.

GELATIN DRESSING:—

- ℞ Gelatin, 15 to 25 parts.
Zinc oxide, 10 to 15 parts.
Glycerin, 15 to 25 parts.
Water, 50 parts.

To this may be added 2 parts of ichthyol.

This is heated over a water-bath each time it is to be employed, a good coating painted on with a brush, and when partly dry—in one to five minutes—the parts wrapped with a gauze bandage. The whole dressing becomes dry and fixed, and may remain on from two to six days, and then soaked off, cleansed, and a new dressing reapplied. In some cases the larger quantity of gelatin and smaller quantity of glycerin may preferably be incorporated, and then the gelatin coating will dry more quickly and will form a sufficient dressing without the gauze bandage, although this latter seems to be of real advantage in keeping the gelatin from becoming soiled and from being rubbed off. If the gauze is not used a small quantity of a dusting-powder may be applied over the gelatin.

The above is especially applicable in the treatment of eczema of the lower legs. Other drugs may be added, but certain medicaments exercise an inhibitory influence on the setting of the gelatin, and if used should always be used with a dressing more rich in gelatin and with less glycerin and less water; such remedies are resorcin, salicylic acid, and carbolic acid. White precipitate, sulphur, and acetanilid may also be incorporated in such dressings.

TRAGACANTH DRESSING.—Pick's trag-

acanth dressing—linimentum exsiccans—is also a useful fixed dressing in the cooler weather. It consists of

- ℞ Tragacanth, 5 parts.
Glycerin, 2 parts.
Boiling water, 95 parts.

To this can be added 2 per cent. of boric acid or 2 per cent. of carbolic acid, and 5 to 10 per cent. of zinc oxide or calamin, or equal parts of both.

This is smeared in a thin coating over the diseased area and allowed to dry on, which usually requires several minutes. The parts can then be bandaged or be sprinkled with some indifferent dusting-powder. It is a more simple dressing than the gelatin application, requires no preparation, but is, upon the whole, less useful. Other medicaments may be added in addition to those already named.

ACACIA DRESSING.—This constitutes another fixed dressing that is readily applied and which may be used on dry parts. A good formula is the following:—

- ℞ Mucilage of acacia, 5 or 6 parts.
Glycerin, 1 part.
Zinc oxide or calamin, or a mixture of both, 2 parts.

Carbolic acid or any other drug may also be added if desired.

This is painted on with a brush or smeared over in a thin layer with the finger; it dries in a few minutes. If at all sticky or for further prevention against this, a dry powder of zinc oxide or talcum can be applied over it.

Another method of treating these cases which can at times be employed with great benefit is by means of the so-called salve- and plaster-mulls (made by Beiersdorf). These are variously medicated. The mild salve-mulls and the

moderately strong salve-mulls, and the moderate strength plaster-mulls are adapted for the subacute cases. While especially useful in some cases, occasionally their action is not so satisfactory. Their disadvantage is their costliness.

In eczema of a chronic sluggish type strong applications must be usually made before a result is brought about. The different remedies and combinations referred to in speaking of the treatment of the subacute type may be first tried; later, when necessary, treatment may assume a bolder character, various remedies being used in stronger proportion. Of value in many of these cases may be mentioned—ointments of calomel, 40 to 80 grains to the ounce; white precipitate of about the same strength; salicylic-acid ointment, 20 to 60 grains to the ounce; resorcin, about the same proportion; sulphur, 10 to 60 grains to the ounce (used at first with caution); tar ointment, either in official strength or somewhat weakened; or the liquor carbonis detergens, with simple cerate or as a wash, pure or diluted.

An ointment of 20 to 40 grains of pyrogallie acid to the ounce may be cautiously tried in obstinate cases. The same may be said with regard to chrysarobin; but this latter should not be used about the face. The various fixed dressings referred to in the treatment of the subacute variety will also be of value in the chronic type. Collodion may also be used as a basis for fixed dressing in localized areas of disease. The stronger salve- and plaster-mulls and the medicated rubber plasters, the latter especially in the sclerous and verrucous forms, are also of distinct advantage in these cases; in sluggish, thickened areas repeated shampooing with green soap and hot water, rinsing off, and immediately followed by a mild ointment applied as a

plaster acts admirably in some instances. Painting such areas with solutions of caustic potash, 1- to 5-per-cent. strength, allowing to act for a few minutes, then rinsing off and applying a mild ointment is a somewhat similar method of treatment which is serviceable at times. In some obstinate cases thoroughly stirring the skin with a strong remedy, instituting a substitutive inflammation, and then applying mild remedies will not infrequently bring about the desired result.

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Superficial scarification of patches of eczema employed in certain selected cases. The patches are scarified in parallel lines, one to one and a half millimetres apart, in one direction only, by a very pointed instrument penetrating to the superficial layer of the dermis. These areas are then encouraged to bleed and bathed with boiled water, and then covered with tarlatan dipped in boiled water. On reaching home cold potato-starch poultices are applied until the next treatment—generally three or four days later. Before beginning the treatment the patches are prepared by the application of continuous cold plain starch poultices. Six to sixteen treatments suffice for a cure. A reaction is set up in the patches, but no scars result. This treatment is to be used only in special cases characterized by isolated disks in limited number. Jacquet (*Bull. Gén. de Thérap.*, Jan., '98).

In infants the face or face and scalp are by far its common site. The disease may, however, occur upon any part at any age. The treatment in regional eczema is essentially the same as the treatment of eczema of any part, common sense suggesting selection or avoidance which the character of the region may suggest; as, for instance, upon hairy parts, as the scalp. Ointments containing large percentages of pulverulent substances, such as the so-called salicylic-

acid paste, should not be employed, as they would tend to produce crusting, matting, and messiness.

Literature of '96-'97-'98.

In treating a case of infantile eczema the search for the cause should go hand in hand with the treatment, which is otherwise only palliative; carefully examine both child and mother. In an acute eczema of a few days' standing decided amelioration may be obtained by calomel. Some cases are benefited by judicious use of codliver-oil and iron. The local treatment is very important for the comfort of the patient. The crusts can be removed by salicylated oil. Washing with water should be strictly interdicted, oil being used as a substitute. The local conditions can now be treated very happily by Lassar's paste:—

R Zinc. oxid.,

Pulv. amyli, of each, 2 drachms.

Petrolatum, $\frac{1}{2}$ ounce.

In acute cases, boric acid, 10 to 20 grains to the ounce, or in less acute cases salicylic acid, 10 grains to the ounce, may be added. Ichthyol, 5- to 10-per-cent. should be added in the older cases, where the skin is thickened and scaling is excessive. In all cases the application should be changed two or three times daily, every precaution being taken to see that the skin is kept covered and scratching prevented. Alger (Amer. Med.-Surg. Bull., Aug. 1, '96).

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ELATERIUM AND ELATERIN.—

Elaterium is a sediment deposited from the juice of the squirting cucumber (*Ecballium elaterium*, A. Rich). This sediment, when dried, appears in friable cakes about $\frac{1}{10}$ of an inch in thickness, flat or slightly curled, and of a pale-green, grayish-green, or grayish-yellow color, the yellow tinge appearing when the drug is old. Its odor is feeble and its taste bitter and slightly acrid. It

is partly soluble in hot water. It is official in the B. P., but not in the U. S. P. Elaterin (elaterinum—U. S. P., B. P.) is the active principle of elaterium, being found therein in amounts varying from 5 to 40 per cent. It is a neutral principle and appears as small, white, or yellowish-white crystals, without odor, but of a very bitter and acrid taste. It is freely soluble in chloroform, slightly soluble in ether and alcohol, and insoluble in water. Elaterin is preferred for administration because of the great variability in strength of different specimens of elaterium.

Dose and Physiological Action.—The dose of elaterium is $\frac{1}{8}$ to $\frac{1}{2}$ grain. Elaterin is given in doses of $\frac{1}{20}$ to $\frac{1}{10}$ grain, preferably in granules; a trituration of elaterin (10 per cent.) is official, the dose being $\frac{1}{2}$ to 1 grain.

Elaterium is a decided irritant to the mucous membranes and also to the skin. When given internally its chief action, in man, is to produce profuse watery stools. When given in proper doses, these large water evacuations occur without undue pain or any apparent gastrointestinal irritation, and for these reasons elaterium claims first rank as an hydragogue purge.

Poisoning by Elaterium.—In large doses or in debilitated persons its use may produce so much prostration and exhaustion as to demand the exhibition of stimulants and other supporting measures. In addition to nausea, vomiting, excessive purging, and exhaustion, the use of too large doses of this drug may even be followed by death from gastroenteritis. Debility from old age or other cause and gastro-intestinal irritation or inflammation contra-indicate its use. The subcutaneous use of elaterium, although capable of producing catharsis, is not advised, on account of the severe

local irritation and inflammation thereby induced.

Treatment of Elaterium Poisoning.—The treatment of poisoning by this drug is practically that of gastro-enteritis. Morphine should be given hypodermically, and hot applications (stupes or flaxseed poultices) should be made over the abdomen to allay the pain and control the irritation and diarrhœa. Especial care should be had in the selection of a proper diet. Bland, easily digested, and unirritating articles of food should be selected. Predigested foods are especially useful in these cases.

Therapeutics.—In general, elaterium is indicated in conditions demanding fluid depletion; the use should not be continued if the stomach becomes disordered or the appetite impaired. It ought never be used in cases of debility or marked exhaustion, and may be followed with advantage by alcoholic stimulants soon after its action is manifest. Its use is suggested in cerebral congestion on account of its depletant and re-constant effects. In poisoning by narcotics and in acute alcoholism elaterium is indicated when the emunctories are not acting freely.

ASCITES AND DROPSICAL EFFUSIONS.—In these affections elaterium is a drug of great value, though one whose use demands much care and judgment. In dropsy depending on aortic, obstructive, or regurgitant disease it is especially useful, given in small doses at first, about $\frac{1}{6}$ grain, on alternate mornings at say 5 o'clock, so that its action is finished by noon. This is claimed, by Hyde Salter, to quiet the heart, relieve the dyspnœa, lessen the pulmonary congestion, and diminish the hydrothorax.

URÆMIA.—Uræmic poisoning is much benefited through the use of elaterium, as it aids the elimination of the uræmic

poison by the bowel. It is especially indicated when uræmia is associated with dropsical effusion.

LIQUID EFFUSIONS OF INFLAMMATORY ORIGIN.—Under this head belong pulmonary œdema, pleurisy, and pericarditis, in all of which the hydragogue catharsis induced by elaterium may be beneficial.

ELECTRICITY. · See APPENDIX, end of sixth volume.

ELEPHANTIASIS—Gr., ἐλέφας, an elephant.

Definition—Elephantiasis is a chronic endemic and sporadic hyperplasia of the skin and subcutaneous tissues, following an inflammatory embolus of the lymph- and blood- channels, and resulting in an inordinate enlargement.

Symptoms.—The legs are involved most frequently; the genitalia of both sexes follow closely, while many other parts—the face, body, and extremities—are occasionally attacked.

Case of congenital elephantiasis. Mental development considerably below par. Had congenital hypertrophy of the face, eyelid, and scalp, confined to right side. The right eye had become diseased in early childhood, and had been removed. The hypertrophy seemed confined chiefly to the skin and subcutaneous tissue; the upper eyelid was greatly thickened and pendulous, reaching down to the upper of the alæ nasi. There was a well-marked, irregular depression in the region of the squamous portion of right temporal bone, and in one place a slight loss of bony substance. Over the posterior portion of the right parietal bone was a soft, flabby tumor of the scalp about the size of a small hen's egg, freely movable, and covered with a normal growth of hair. Coley (N. Y. Med. Jour., June 20, '91).

Three cases of elephantiasis of the upper lid, in one of which both eyes

were affected. Goraud (*Annales de la Polyclin. de Bordeaux*, Apr., '92).

The right leg is more often attacked than the left, occasionally both are involved; the scrotum is affected with greater frequency than the penis in the



Congenital elephantiasis of the face and scalp. (Coley.)

male, and the labia majora and minora than the clitoris in the female.

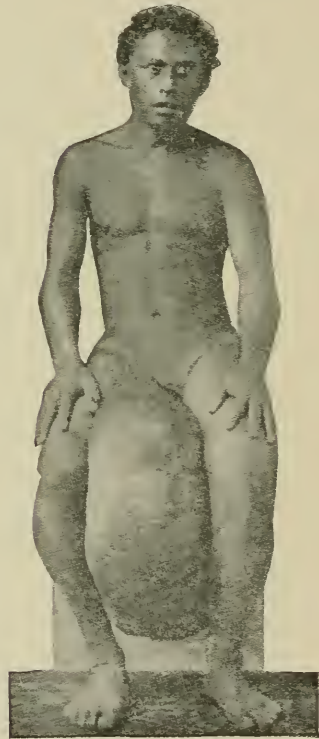
Case of a man, 19 years old, in whom the foreskin and scrotum began to enlarge at the age of 4, continuing until it had reached the enormous size shown in illustration. Operation successfully performed. Uthemann (*Deutsche med. Woch.*, Dec. 5, '95).

Elephantiasis of the vulva observed in a mulatto woman who was four months pregnant. The tumor encroached upon the vaginal orifice so much (the clitoris and labia majora and minora being all involved) that delivery at term would have been impossible. Hence the mass was removed with the knife, being first constricted with an elastic ligature tied under three long pins passed beneath the tumor. Bleeding vessels were thus secured separately and the wound closed

by sutures. Pregnancy was not disturbed. Mundé (*Amer. Jour. of Obstet.*, Oct., '95).

Literature of '96-'97-'98.

Form of chronic enlargement of the testes frequently met with in the inhabitants of warm countries, and associated, in many instances, with elephantiasis of the scrotum and lower extremities. This form of testicular enlargement, which is associated with swelling and induration of the epididymis and spermatic cord, even when existing alone, is held to be invariably of the nature of elephantiasis,



Case of elephantiasis of the scrotum. (Uthemann.)

and not due to any malarial influence. After castration and during an operation for hydrocele, it has been found that this condition is the result of a distension of the lymph-vessels of the tunica albuginea, epididymis, and cord, and of an excessive proliferation of the con-

nective tissue. The filaria undoubtedly plays a considerable part in the genesis of such morbid conditions. Le Dentu (Revue de Chir., Jan., '98).

No inconvenience or pain accompanies the disease in the majority of cases, but very often when the scrotum is the part attacked stomachic and nervous distress is encountered. Radiating pains may be observed in the seminal nerves, thus causing intense nausea and vomiting. Hydrocele may be induced.

The prodromic stages differ according to whether the elephantiasis occurs in hot or cold climates. In hot countries there appears a preliminary fever termed "elephantoid fever," which is preceded by pains of great intensity in the lumbar region, accompanied with retching and vomiting, cold shiverings located along the spine, followed by fever and profuse perspiration in successive alternations. The colder atmospheres do not occasion such marked distress during this early stage.

In patients suffering from elephantiasis once or twice a month there is an excess of fever. The local symptoms accompanying the fever are those of lymphangitis with ganglionic enlargements. These attacks of lymphangitis with fever coincide with the invasion of the connective tissue of the hypoderm and of the associated lymph-channels by microbes. The visible lesions are the result of hundreds of febrile crises, each accompanied by a fresh advance of œdema. Each new œdematous deposit is probably followed by local organization of the emigrated embryonal cells in adult connective tissue. Tropical elephantiasis is usually due to the *Filaria sanguinis hominis*. Sabouraud (Annales de Derm. et de Syphil., May, '92).

The course of the affection, whether occupying the leg or elsewhere, is characterized by frequent exacerbations. Deeply-seated, recurrent forms of dermatitis, or attacks of an erysipeliiform (or

true erysipelas, the streptococcus of erysipelas being found in some cases) inflammation, with, at times, involvement of the lymphatics (from which milky or chylous discharges may be noted with or without puncture) are encountered. While these phenomena are primarily localized in the deeper tissues, the skin does not seem to be attacked until later, when it presents nodular increase in size.

With proper measures these symptoms abate, only to reappear at some later period. At each successive attack the part is noted to have increased in size to an appreciable extent. These recurrences of fever and œdema may appear at intervals of weeks only, while months or years may intervene between each recrudescence. At times the recurrences of these phenomena may be so frequent or so close that the previous inflammation has not had time to disappear. As each attack leaves an increase in size we may, after a time, find a gigantic enlargement of the part involved. These inflammatory phenomena may not always be observed, as the part may often be found to increase in size without their apparent assistance. It is difficult to cause pitting in these structures, owing to the general hyperplasia. The skin, as previously noted, does not appear to participate in this process early, but later it becomes likewise affected. It is tightly stretched, glossy or waxy, with pigmentary changes of color varying from brownish red or pinkish red to one of dusky brown. Upon its surface may be seen an accumulation of sebaceous material, with here and there desquamations of epithelium. The linear fissures of the skin may increase so greatly that enormous sulci may be formed. Hard or soft tubercles may appear upon its surface at various parts, either showing some scaly desquamation at their summit or becoming denuded of

epithelium; they present numerous bleeding-points or the top of the tubercles may be one bleeding surface. In fact, many cases seem to present a chronic eczema upon the skin of the thickened part, and this appears to follow its usual characters. In other cases shallow ulcers, which resemble ordinary breaks of continuity, may be found at points over the affected skin. The parts around the joints form decided strictures, and the overlapping enlargement thus causes deep fissures in which a milky or chylous exudation, intermixed with sebaceous discharge, cause painful maceration of the inclosed skin. At certain points the lymphorrhagia may be so excessive as to cause great depression of vitality.

While this increase occurs in the softer parts of the affected structures, the bones alike share the enlargement in all their dimensions, and glandular involvement is often noted. The leg resembles closely its counterpart in the elephant both externally and in size-proportion. The weight becomes out of all proportion to other parts of the body, and while subjective sensations are, for the most part, encountered during the inflammatory attacks, they may be observed after the affected portion has been allowed to remain in one position for an indefinite period. Pain is then found to follow excessive fatigue, and tearing, stabbing sensations are reverberated throughout the affected leg. When other parts—such as the scrotum and penis or the labia and clitoris—are involved, the same process intervenes and the enlargement hangs down between the legs, and may weigh many pounds. The penis usually becomes indistinguishable in the large mass and an opening or groove is left through which the urine trickles. The face (cheeks and nose), shoulders, arms,

forearms, and the hands may share in the tumefaction, but do not show the same complications observed when the leg or genitals are involved. Other enlargements of enormous extent are described, such as the elephantiasis telangiectodes of Virchow, which is of congenital origin and affects the vascular tissues.

Case of elephantiasis telangiectodes and molluscum fibrosum in a small, rather deficient man who showed a number of sessile tumors, more or less subcutaneously movable, over the body and limbs. Patient's mother and father had also suffered from small subcutaneous tumors. There was inequality of the lower extremities, and marked irregular hypertrophy of the left femur, and on the left tibia was a large osteal growth. Large, loose folds of elephantiasic growth existed on the left thigh. The case illustrated the hereditary character of the affection; its occurring in one somewhat imperfectly developed in mind and body indicates the connection between elephantiasis and molluscum fibrosum and a condition analogous to the fibrovascular hypertrophy of the subcutaneous connective tissue taking place in the osteal tissue. Calwell (Brit. Med. Jour., Jan. 4, '90).

Diagnosis.—Cases of elephantiasis after reaching their full development are easily recognizable. The enlargement, with difficulty to cause pitting; the appearance of warty or keloid-like tumors; the history of repeated attacks of erysipelas, deep dermatitis, or a recurrent eczema, should be sufficient to draw attention to this affection.

Care should be taken not to confound elephantiasis with pendulent tumors, such as overhanging forms of fibroma, which may closely resemble the enlargement found in the former affection. Enlargements due to eczema or syphilis will usually present symptoms of both of these conditions sufficient to prevent error if care be taken. Acromegaly and

myœdema present symptoms which will be sufficient, if carefully studied, to make a proper diagnosis of these conditions. Constriction of a limb by means of bandages happens very frequently, and, as enlargement may follow, close examination will reveal the reason for this increase. In fact, close attention to every detail should be carefully studied, when the diagnostic differences of the several similar affections may easily be detected.

Etiology.—While the affection may be observed in any country, certain regions, owing to their climate, are noted for the prevalence of an endemic type of elephantiasis, while sporadic types prevail in other countries. It attacks both sexes, although the male, however, three times more frequently than the female. Age does not seem to influence its appearance, but middle or adult life shows the largest number of cases. Congenital types may be noted.

[The appearance of four cases in one family has been recorded by Nonne (Virchow's Archives, 125), who referred to their attacking both limbs. J. ABBOTT CANTRELL.]

The influence of heredity has been shown by many recorded cases. Change of climate seems to lessen the tendency of the disease, and cases are benefited in which the affection has proceeded for some time. Unhygienic surroundings—such as malarious districts or parts bordering upon the sea—exert a deleterious influence. The fair types of mankind do not show as marked a tendency to the affection as do the darker types.

The mosquito is thought to play an important part in the production of elephantiasis. Encroachments of large tumors, as well as pressure of various kinds, upon the veins and lymphatics are also considered as predominating etiological factors.

Case of a man who suffered from elephantiasis of twelve years' growth consequent upon a burn. Berry (Provincial Med. Jour., May, '89).

Case of elephantiasis of leg in a woman, aged 36, whose right foot was crushed, a condition of elephantiasis of the leg gradually setting in. A year afterward the leg was amputated. Œdema of the left leg commenced a few months later. It is much enlarged and in a condition of solid œdema, but the skin is smooth and shows no lymphatic enlargements. The disease never extended beyond the knee in either leg. The accident probably set up a chronic erysipelatoid inflammation, which gradually passed into elephantoid œdema, and the inflammation spread by the lymphatics, and crossed the pelvis, thus producing a similar condition in the other leg. Hutchinson (Clin. Jour., Nov. 6, '95).

Case of elephantiasis of the penis subsequent to a gonorrhœal lymphangitis. Humbert (La Semaine Méd., May 25, '94).

Case of elephantiasis of the female external genitalia. The diseased portion was removed, the operation being ultimately followed by recovery. Microscopical examination of the parts removed led to the conclusion that the origin of the alterations could be carried back to an attack of acute gonorrhœa. The gonorrhœa had given rise to chronic inflammation of the lymphatic vessels of the vulva, which inflammation became the starting-point of the tumors. In consequence of the great cell-production of the lymph-ducts, the structure of the epidermis and of the corium were overgrown; they then became atrophied and disappeared little by little, either through hyaline degeneration or through formation of connective tissue. The vessels were also obliterated in this manner, and not by endarteritis obliterans. Farner (Münch. med. Woch., May 7, '95).

Case in which, two years before, the patient had acquired syphilis and suffered from suppurative buboes in both groins, the left side being the worse; she treated the affection herself. A

year later she first noticed an increase in the labium majus of the left side, and this has steadily gone on until it is the size of the fist. In both groins there are scars, that on the left being deeper and more extensive. This case regarded as having an important bearing on the treatment of bubo. The extensive destruction of the inguinal lymphatic vessels was the result of neglect of early incision and antiseptic treatment of the suppurative buboes. The elephantiasis described is due to the obliteration of



Unilateral elephantiasis of the face and neck. (*Moncorvo*.)

the lymphatics. M. Schreider (*Derm. Zeit.*, B. 2, H. 5, '95).

Three cases of persistent œdema and elephantiasis observed following the extirpation of lymphatic glands. Riedel (*Archiv f. klin. Chir.*, B. 47, Nos. 3, 4, '94).

Literature of '96-'97-'98.

Case of elephantiasis observed in a little girl 3 years old. Her grandmother had had several attacks of lymphangitis of the legs, followed by elephantiasis. The mother of the child never had either of these diseases or erysipelas. A fall

upon the abdomen is thought to have an etiological relationship to the disease of the child. When the baby was born a deformity of the face was found which was due to an abnormal production of a soft, elastic, uniform, and indolent tissue, which spread from the zygoma to the external commissure of the eyelids and back to the insertion of the ear posteriorly from the mastoid process to the inferior border of the thyroid cartilage. A number of these cases observed, and the explanation advanced is that, streptococci having found their way into the foetal circulation through the placenta, an inflammatory process was set up in the foetal tissues, resulting in the overgrowth of tissue. *Moncorvo* (*Pediatrics*, Dec. 1, '97).

Pathology.—The changes of elephantiasic areas are more directly located in the subcutaneous tissues, the upper and lower strata alike sharing in the characteristic phenomena. The skin, although presenting these changes, is more markedly affected where papillary outshoots are observed. Upon cutting into the affected areas there is observed a yellowish or grayish mass, which in some places shows a resemblance to fatty or lardaceous deposits, while in others gelatinous formations are simulated. Exuding lymph may be observed at many points. The changes from the normal are of a distinct hypertrophy: there is decided proliferation of the epidermis, with hyperplastic increase of the corium, while the fibrous elements of the subcutaneous tissue are observed in hardened bands or meshes or noted to be soft or liquefied. Distended lymph-spaces are found throughout the microscopical section. All the soft parts, the blood-vessels, lymphatics, nerves, and their component parts, as well as the bony structures, share in the general enlargement and cell-infiltration. At times, the muscles and the glandular structures of the skin participate in the increase of size.

Obstruction is clearly the influence in the production of elephantiasis. The presence of the *Filaria sanguinis hominis* in the lymph-vessels is directly the cause in endemic varieties of this condition. Manson states that the parent-worm occupies some portion of the lymph-trunk, at which point it discharges the ova into the stream of lymph; these are then carried forward to some of the glandular structures, in which they find a lodgment. When hatched they enter the general circulation. Abstracted from the blood by the mosquito, and deposited again into a water-stream, the ova again reach man when contaminated water is employed. The more aggravated the symptoms, the more numerous are the parasites in the lymph-channels. Hæmorrhage and discharge of lymph may be observed in these types.

In sporadic types of the affection, in which the obstruction may be induced through encroachment of large tumors or other forms of pressure upon the veins and lymphatics, the same features are developed. Although they are indistinguishable, there is no mistaking the condition. Eczema of a most chronic variety, frequent attacks of erysipelas or other forms of deep dermatitis, as well as tight bandaging of a part may also be the inducing factors.

Prognosis.—Although the disease does not tend to shorten life, much discomfort, as well as intercurrent maladies, may place the affected person in an unenviable condition. Endemic cases may be greatly benefited by a change from a malarious or sea district. Sporadic types are likewise improved by change of climate. The discomfort may alone be caused by the weight of the affected part, which may often be removed by surgical measures, thus insuring relief. Early cases should be immediately removed to

other regions; if this is done, a favorable result will be reached early. This step often arrests even cases of long-standing.

Treatment.—In endemic cases which are preceded by the preliminary fever, with its accompanying phenomena, recourse must be had to the measures generally adapted to most febrile manifestations. Salines, acetanilid, quinine, and einchona, which influence miasmatic fevers and their consequent complications, should be administered. Tonics will be demanded in many cases in which the depressing effects of recurrent attacks of erysipelas or deep inflammations are experienced. Codliver-oil, with or without the hypophosphites, iron, strychnine, certain mineral acids (hydrochloric or sulphuric), and possibly arsenic may be found beneficial. Again, all complications should be remedied as they appear in the several cases encountered. All cases of this affection should be removed from countries in which the disease is endemic or where malarial or other miasmatic atmospheres are found. Sporadic cases are to be removed as well to some healthy climate. Iodine (or its preparations) and mercury have been recommended for their absorbent qualities. Sterilization of drinking-water at all times may have an indirect influence in the prevention of this disease.

Surgical interference, of one kind or another, may be productive of some fairly-good results. Large growths of enormous weight have been removed by this means. The penis and testicles have been restored to their normal conditions in a large number of cases.

Literature of '96-'97-'98.

Series of sixty operations successfully performed. The weight of the tumors varied from one and a half to thirty-nine pounds. The usual incision is made along the penis, which is thoroughly de

corticated; and by vertical incisions over the cords, down to the fundus of the tumor, the testicles are enucleated, and, all blubbery material being carefully removed, the organs are placed on the pubes in a wrapping of gauze. The upper ends of the vertical incisions are joined to the wound over the penis. Lateral oblique incisions are made through healthy skin and fat along the sides of the tumor; they pass downward, so as to meet just in front of the anus. The mass is then carefully dissected off, exposing, on its removal, the accelerator urinæ in the middle and the limbs of the pubic arch at the sides. All bleeding vessels are ligatured. One now sees the decorticated, but turgid, penis; the testes with cords of, it may be, eighteen inches' length; and a large triangular wound, fairly representing the superficial dissection of the anterior half of the perineum. The skin and fat bounding the wound on either side are raised up from the fascia lata, over the hamstrings, for a distance of about three inches. The testes are united to each other in the middle line by three or four interrupted sutures. The edges of the sliding lateral flaps are then brought together over the testes by a series of strong quilt-sutures. The penis is covered by the anterior end of the thigh-flaps, and by flaps raised from above the pubes, with or without the addition of Thiersch grafts. The whole wound-area is dusted with iodoform, and covered with suitable dressings. It is essential that the dressings be kept in place by well-applied bandages. Healing takes place throughout by first intention in about eight days. Havelock Charles (Indian Med. Rec., No. 5, '97).

The cicatricial tissue following this treatment always gives a protective covering to the structures. Surgeons have abandoned the use of the ligature because of the likelihood of causing more disturbances to the already-obstructed circulation. The method of treatment generally resorted to by surgeons at the present day is compression. This may be considered as equal in value to ligature,

but it is less likely to provoke other conditions likely to promote enlargement. Pressure may be applied by the use of some form of bandaging. Elastic bandages, such as those advocated by Martin, or ordinary muslin of close texture, to insure firmness, may be applied to the enlarged areas, beginning at its lower and approaching the upper part in gradual pressure. This means has been followed, however, by untoward consequences, such as gangrene at one point or another, and should be carefully watched.

J. ABBOTT CANTRELL,

Philadelphia.

EMPYSEMA. See LUNGS, DISEASES OF.

EMPYEMA, THORACIC.—Empyema: Gr., *ἐμπυεῖν*, to suppurate.

Definition.—Empyema is an accumulation of pus in the pleural cavity independent of the lung-tissue.

Varieties.—The various kinds of suppurating pleuritis are pulsating empyema, multilocular empyema, tuberculous empyema, double empyema, putrid empyema, and interlobular pleurisy.

When a collection of pus is so situated as to be synchronous with the heart-beat, it is denominated pulsating.

In cases of pleuritic adhesions and the circumscribed diaphragmatic pleurisy, we often have encysted collections, which are usually many in number. Tuberculous empyema occurs in scrofulous subjects and is often localized, with caseous masses. Double empyema occurs simultaneously on both sides, while interlobar pleurisy is the inflammation in the visceral pleura, or that covering the lung, and pyæmic exudation accumulating in the interlobar fissures.

The interlobar empyemas are not primarily abscesses of the lungs, but of the

pulmonary pleura; but necessarily assume the form of abscesses of the lung if not circumscribed by adhesions or evacuated early. The putrid empyema is a form resulting from neglect and long exposure to the various pyogenic micro-organisms, such as saprophytes, and the streptococci and staphylococci, resulting in pyæmia and septicæmia.

Symptoms.—In most cases of empyema there is a history of exposure to dampness or overheating. A chill comes on, then fever, and pain in the side. The disease may not have been regarded as serious or a relapse may have occurred. In a few days dyspnœa and unusual restlessness call the attention of the patient again to his chest. In a month or two the clinical picture has gradually changed; the patient, perhaps florid and plethoric, may have become emaciated and morose, a short loose cough suggesting the presence of consumption, which apparently becomes confirmed when night-sweats are noticed. The aspect of the face and the posture is that of extreme exhaustion. The physical signs are pain in the side affected. This may be one of the first symptoms; but the most marked of these is discomfort due to dyspnœa and to the absorption of pus.

The skin may be clammy and bathed in a cold perspiration. The respiration is about 40 to the minute; temperature from 103° to 105°. There is dullness on the affected side, with change of sound under auscultation and percussion when sitting, when lying down on the back, or if the patient be turned on one side.

Twenty patients examined with special care in regard to the change of level of a pleuritic exudation as the patient's position is altered. Anything that might, by acting as a damper upon the thorax-wall, give rise to apparent dullness, such as pillows, mattress, supporting hands placed against the back, etc., was

avoided, many of the apparent changes in the level of dullness being due to these agents. The thorax-wall must be set in vibration and give character to the percussion-sounds. If a damper is so applied as to stop these vibrations, a dull note results. A normal thorax, if percussed in the position a pleuritic patient assumes, will give a dull note on certain lines. In only one case out of the twenty did the examination reveal any change in the line of dullness. Strauch (Virchow's Archiv, June 1, '89).

In children there is not so apt to be a bulging in the intercostal spaces on the diseased side; the lung, being soft and compressible, offers the point of least resistance to the pressure of the fluid. Chapin (Archives of Pediatrics, June, '90).

Skodaic resonance is a term used to indicate Skoda's discovery of an area near the clavicle which is always free from the extreme flatness found in empyema,—unless this area be also invaded in cases where the dullness is found in all portions of the chest, in which case the cavity is full of pus. This is also accompanied by a disappearance of the vocal fremitus on the affected side. If a finger-tip of the left hand is held in an intercostal space over the region and a finger-tip of the right hand is held in a corresponding intercostal space on the sound side, and the patient is told to count audibly, no sound-waves seem to be transmitted to the finger placed in the intercostal space on the affected side, and the finger on the sound side feels the impact or vibratory motion communicated through air by the sound-motion. The symptoms of serous effusion vary slightly, and yet this wave-motion may be communicated better by serum than by pus.

The variety of sounds heard in the early stages of pneumonia upon auscultation is followed by a complete loss of sound on the affected side in empyema. The respiratory murmur is *nil*. The

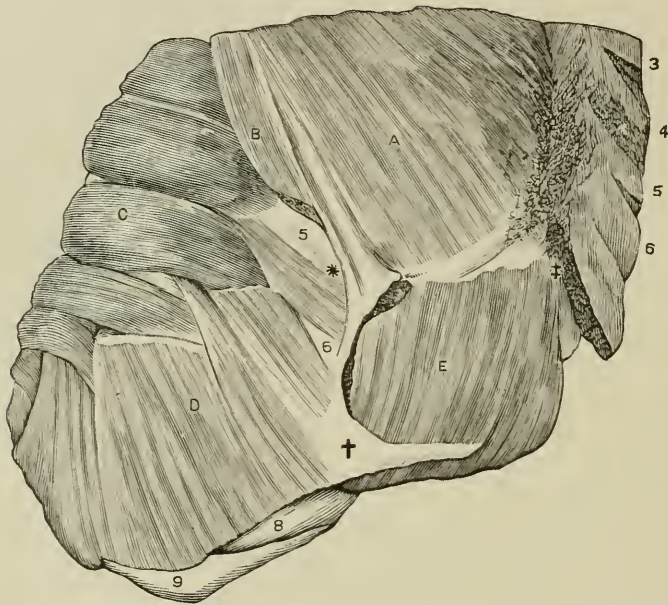
bronchial murmur above may be perceptible.

The most-marked cases are the only ones in which all of these signs and symptoms obtain; for, with a small accumulation of pus, very little more than the rise of temperature and dyspnoea exists. The final termination of a case not recognized and treated would be a pointing and rupture externally or internally. The most usual points of rupt-

called the region of Traube. (See wood-cut.)

Literature of '96-'97-'98.

[The spontaneous discharge of empyema without any untoward results was observed by me in the case of a young girl, aged 8 years, who had been attacked with influenza, and, later, with severe pleurisy, accompanied by high temperature, weak and rapid pulse, night-sweats, and hectic, showing great absorption of pus. In the course of time,



Lower part of thoracic walls on the right side. *A*, pectoralis major; *B*, pectoralis minor; *C*, serratus magnus; *D*, external oblique; *E*, rectus abdominis; 3, third costal cartilage; 4, fourth costal cartilage; 5, 5, fifth costal cartilage; 6, 6, sixth costal cartilage; 7, seventh costal cartilage; 8, eighth costal cartilage; 9, ninth costal cartilage; *, placed just above Mr. Marshall's spot; †, aponeurosis, common to external oblique and pectoralis major and covering rectus; ‡, xiphoid appendix.

ure have been the weakest and least resistant: *i.e.*, internally, above into the bronchi or trachea; and, externally, at the free spots of Marshall or of Traube. The point on the right side which is comparatively free from muscular covering is called the free spot of Marshall, while that on the left side, as in this case, is

a prominence about the size of a hen's egg was noticed on the right side near the costal cartilage. After a simple incision the pus was fully evacuated through the opening, which remained patulous for about three years. The examination of the patient now shows a slight lateral curvature of the spine, with a lack of development of the mam-

mary gland on the right side, but with a considerable chest expansion and very slight impairment of the lung. The patient is rapidly developing into womanhood and has regained her health and strength.

The discharge of pus in the left side was observed by me in a boy at Anniston, Ala., in whom a serous pleural effusion had been aspirated, and had been treated by medication also. The degeneration of serous exudation into pus was verified in this case. Osler has stated that he has never seen a case of serofibrinous effusion degenerate into purulent pleurisy, but, according to W. M. Pirt, literature shows many similar cases. The region at which the pointing occurred in this case was in the left intercostal space, immediately below the apex of the heart. I performed the operation of resection of a portion of the sixth costal cartilage on the left side, and secured drainage with a strip of gauze passed daily through the fistulous tract. The patient made a good recovery, also; and, being young and vigorous, overcame the tendency to scoliosis. The last report from him showed that there had been no redevelopment of pus, and that the fistula had been closed. J. McFADDEN GASTON.]

The Marshall and Traube regions are points of least resistance and, although higher than the pus sometimes reaches, may be considered the most available for spontaneous discharge. It is for this reason, and because the region of Traube is least liable to complications with the diaphragm, pleura, and abdominal wall, that Jaccoud, of Paris, selected it for the introduction of a trocar. J. H. Cox has reported a case in which spontaneous evacuation took place in front between the sixth and seventh ribs. Recovery followed.

Case of a young lad in whom there was no history of an injury; so that the development of empyema was thought to be due entirely to a latent cause. The head of the abscess appeared to the right and an inch below the left nipple.

At this point an incision was made obliquely to the ribs. The pus was allowed to be pumped out by the breathing of the patient, and a large quantity was evacuated. A second incision was made about six inches below and to the left of the first, and a drainage-tube was inserted, passing through both incisions, so as to secure a free and thorough drainage off of the pus. The cavity was washed out with a solution of the bichloride of mercury. The incisions were closed with silver sutures and dressed antiseptically. The patient's temperature did not exceed 100°, and had run down to 97°. He had a good appetite all the time, and had made no serious complaint, notwithstanding the extensive extravasation of pus. John Ashhurst (Times and Register, Aug. 31, '89).

The pus may discharge through the intercostal spaces, but fail to reach the surface at the point on account of muscles; then it burrows beneath them. In regard to the spontaneous escape of pus in thoracic empyema, a case has been reported in which it took place at the umbilicus. This location of the weak point is a corroboration of the theory that pus escapes at the point of least resistance, and not always at the point of the lowest pressure. (J. G. Willis.)

[I witnessed the case of a man at the Atlanta Polyclinic, who had a whole quart evacuated from the incision made into an axillary abscess communicating with an empyema. The patient was lost sight of after the first evacuation by me, and it is supposed that he must have been relieved by the use of a gauze drainage and packing at that time. J. McFADDEN GASTON, JR.]

Diagnosis.—The diagnosis may be made from the extreme dullness and lack of respiratory sounds, when the temperature remains elevated. But an exploratory puncture is advisable to determine definitely a case of empyema.

Subphrenic pyothorax can be recognized by the results of high and low aspiration, in a large percentage of all

cases. High punctures, in the fifth intercostal space, show a collection of pus or serum, while low punctures, as the eighth intercostal space, yield pus which is always ichorous. Scheurlen (*Charité-Annalen*, vol. xiv, p. 158, '89).

Two cases of pulmonary abscess simulating empyema. Kauffmann (*Birmingham Med. Review*, Oct., '93).

Literature of '96-'97-'98.

Case of subdiaphragmatic abscess containing pure culture of bacillus coli communis observed which simulated empyema. F. Tilden Brown (*N. Y. Med. Jour.*, Feb. 29, '96).

Pleuritic effusion and a carnified or hepatized lung should be borne in mind, and they may be excluded when the exploring needle reveals pus.

At times cases of empyema may be confounded with ordinary intramural abscesses, as when they occur near the axilla, and are incised. We have found several cases among negroes treated late and who had been neglected.

Etiology.—Pleurisy with its usual sequelæ of pleural effusion is the most common etiological factor. The inflammatory complications of pneumonia are also among the causes.

A large proportion of empyema in children follow or complicate processes in the lung of an acute character. Koplik (*Archives of Pediatrics*, Oct., '90).

Successful cultures of pneumococci made from the pus of an empyema complicating pneumonia. Thue (*Centralb. f. Bact. und Parasit.*, Jan. 8, '89).

Empyema is always caused by micro-organisms, but not of one specific variety. Bewley (*Dublin Jour. of Med. Science*, Nov. 1, '90).

Literature of '96-'97-'98.

There are four main groups of cases of empyema in children. The first is the metapneumonic, the diplococcus pneumoniae playing chief rôle as etiological factor. In the second group the only

micro-organism found in the pleuritic exudates is the staphylococcus pyogenes or a streptococcus. The third group is due to the tubercle bacillus, and the fourth is the so-called putrid or fœtid empyema. Henry Koplik (*Med. Rec.*, Jan. 25, '96).

Trauma may also give rise to the effusion.

[As an example of traumatism in the causation of empyema, I might mention an instructive case of gunshot wound in the upper portion of the chest on the right side and passing diagonally across to the left side of the abdomen. J. McFADDEN GASTON.]

Tubercular empyema may follow the perforation into the pleural cavity of a tubercular peripleuritic abscess, originating in a tubercular osteitis of the ribs or vertebræ.

Tuberculosis is thought to be caused by pleurisy; on the other hand, Germain Sée and others are quoted by J. C. Castillo, of Lima, Peru, as regarding three-fourths of all pleurisies tuberculous in their origin.

The most frequent cause of pleurisy is, as has been said, the bacillus of Koch.

Pathology.—When the inflammatory process sets in, the pleura becomes thickened, and this, besides the inhibition of the lubricating secretions that occurs, gives rise to a friction-sound: one of the first symptoms of pleurisy to present itself, as well as one of the last to disappear.

The lubricating fluid is rather increased as an effort on the part of nature to repair the damage done to the surfaces by their congested, uneven thickening. This fluid becomes gradually so plentiful that at times it is sufficient to form serous effusion. If the inflammatory product should continue or if pyogenic microbes invade the cavity, suppuration results, and we have empyema.

Literature of '96-'97-'98.

Case of calcareous empyema followed by death. Post-mortem the lung was collapsed and the pleura thickened and coated on its whole internal surface by a thick crust of calcareous deposit, including the upper surface of the diaphragm. The sour, milk-like odor of the discharge toward the last suggested that lactic-acid fermentation was taking place within the cavity. T. Carwardine (Bristol Medico-Chir. Jour., Mar., '98).

Prognosis.—Cases seen early result favorably under proper treatment; hence the rule that cases of empyema should never be allowed to grow old.

Six hundred and fifty-six cases of empyema in children, with one hundred and four deaths. The younger the patient, the greater the risk of fatal termination. The sooner the purulent effusion removed, the quicker the recovery. Danger to life is chiefly due to complications: pericarditis, peritonitis, septicæmia. Wightman (Lancet, Nov. 30, '95).

In all cases the most serious consequence of the affection is deformity, and in children lateral spinal curvature is likely to occur. Pyæmia and septicæmia will result from putrid empyema; and general miliary tuberculosis may follow a localized tuberculous pleurisy which becomes purulent. Rupture into the bronchi, trachea, lungs, with immediate death from suffocation, or into the stomach after perforating the diaphragm, are among the possibilities.

Treatment.—The satisfactory results obtained by Murchison in the treatment of pleural effusions by incision would seem to point to the surgical treatment of many cases, before empyema has set in, as a valuable measure. For this purpose also the use of blood-letting, blisters, and medication may be employed to abort the inflammatory process sufficiently early in the progress of pleurisy

that an empyema need not follow. Blisters and purgation with salines and mercurials should be actively employed, in order that the parts undergoing inflammatory changes may be relieved of the fibrinous element of the blood, tending to retard resolution. Opiates, and especially the camphorated tincture of opium, may be used to relieve pain and hasten the resolution. Carbonate of ammonia, turpentine, and digitalis are all also of value.

[I would strongly urge, especially in children, of an early recourse to the following preparation:—

℞ Hydrargyri chloridi mitis, 1 grain.
Pulv. ipecac et opii, 10 grains.
Quinæ sulphatis, 10 grains.
Pulv. camphoræ, 1 grain.

M. Divide into powders No. x.
Sig.: One powder every two hours.

In adults:—

℞ Hydrargyri chloridi mitis, 6 grains.
Pulv. ipecac et opii, 30 grains.
Quinæ sulphatis, 30 grains.
Pulv. camphoræ, 6 grains.

M. Divide into capsules No. xij.

Sig.: Take one every two hours in day-time, and two capsules at intervals while awake at night.

This should be followed with two tablespoonfuls of oil and one teaspoonful of turpentine.

The bowels are thus emptied, and the turpentine has a beneficial effect upon the bronchial tubes.

I have seen many cases of incipient pleurisy aborted in this way, and the most alarming symptoms of high temperature and rapid respiration controlled. J. McFADDEN GASTON, JR.]

The full and free evacuation of the pleural cavity is not expedient when the pressure has been great, and the lung is pressed upon in such a manner as to displace the heart. In such a case the gradual evacuation by aspiration is preferable.

In a certain minority of cases in children simple aspiration once or twice repeated will effect a permanent and satisfactory cure, but, if it is found that the fluid reaccumulates or septic symptoms develop, then a free incision with drainage is imperatively demanded. Steele (*Jour. Amer. Med. Assoc.*, vol. ii, p. 688, '88).

Aspiration should be limited to one or two trials, for empyemas of the metapneumonic type, as seen in children and adolescents. For all other cases free incision and drainage are indicated. Ransohoff (*Ohio Med. Jour.*, Aug., '93).

The main feature in treatment by a valvular cannula is that the fluid is not withdrawn suddenly, but the cannula merely inserted. This allows the patient to expel any liquid by coughing or deep inspiration, while its valves prevent the entrance of air, to take the place of the expelled fluid. Rogée (*Le Progrès Méd.*, Apr. 7, '88).

Cases in which pus contains large masses of lymph, or pus, thick and creamy, heal best. Offensiveness of pus does not much influence healing. Delay is advisable when there is negative pressure in the pleura, and when expansibility of the lung and contact of layers of pleura can be induced by simple aspiration and cure effected. Otherwise harm will result from delay. Resecting a piece of rib, free incision of pleura, and continuous drainage indicated. Pollard (*Brit. Med. Jour.*, Nov. 2, '95).

The best method of securing counter-pressure and antiseptis at the same time is by the injecting of a saline solution through the one tube

Injections of peroxide of hydrogen in 50-per-cent. solution puts a rapid stop to the formation of pus in the thoracic cavity, and has been strongly recommended as an injection in empyema whenever injections must be used. Editorial (*Jour. Respiratory Organs*, Sept., '89).

Literature of '96-'97-'98.

The safest method of procedure consists in replacing gradually the pleuritic exudate by an innocuous fluid: a solu-

tion (0.06 or 0.07 per cent.) of sodium chloride (common salt). After withdrawal of a small portion of the exudate the same quantity of salt solution is introduced into the pleural cavity. By repeating this operation several times, entire exudate may be replaced by saline solution. The injected liquid disappears by reabsorption as fast as the lung dilates, and the consequences of a sudden diminution of the intrathoracic pressure need not be feared. S. Lewachew (*Times and Register*, Apr. 11, '98).

Immediate relief to syncope has been secured by the reverse action of the aspirator and the injection of the same fluid which has been drawn out.

The practice of aspiration in cases of empyema has still a great number of advocates, and it is probable that an attempt to evacuate the pleural cavity in this way is attended with good results when resorted to early in the progress of suppuration.

The packing of the cavity with iodoform or plain gauze in order to secure drainage has been advocated by Ransohoff, Laplace, and other surgeons. The experience of most practitioners is that a pleural sero-fibrinous effusion does not often degenerate into a purulent collection, and many attribute the pus to the failure of antiseptic precautions in aspiration.

In several cases the following points of interest were noted: Although the pleura had been full of fluid for twelve months, rapid re-expansion occurred. After thirty-seven tapplings the fluid became as clear as at first, in spite of admittance of air. The advice given in text-books to abandon paracentesis after two or three trials should be modified. There is no risk if the operator is careful to keep the instruments aseptic. West (*British Med. Jour.*, Apr. 27, '95).

PARACENTESIS THORACIS. — Aspiration or simple puncture with a long hypodermic needle is performed as follows:—

1. The skin in the intercostal space selected is cleansed with soap and warm water, followed by alcohol, and a carbolic-acid solution of 6 to 100.

2. The needle is aseptized by passing through an alcohol-lamp.

3. The skin is held up and the fact ascertained that there is space enough between the upper surface of the rib and the course of the needle.

4. The needle is then suddenly plunged so as to penetrate the pleura.

5. After removal of the needle the wound is closed with collodion and cotton.

When a vacuum instrument cannot be secured, the surgeon should use devices at his command in preference to awaiting the more convenient forms of apparatus. He can attach a rubber tube to a trocar and cannula, if he is careful to hold the finger upon the outlet of the cannula as he removes the stylet. It would be well to insert a rubber tube into an antiseptic solution, so that the fluid may be carried into it, and no concern need then be felt as to the fluid ceasing to flow, when air would enter if the external orifice of the tube were out.

The exact directions in paragraph No. 3 are based upon the course of the intercostal artery, which is in a groove on the inferior surface of the rib, while the skin should be raised so that a valvular opening shall be made. When the needle is removed, the puncture is not open continuously and shuts out the air.

The thorough preparation of a patient even for so simple a procedure as aspiration, is necessary.

The best and most efficacious drug is strychnine nitrate injected hypodermically before an operation. The combination of $\frac{1}{25}$ grain of strychnine, with $\frac{1}{4}$ grain of morphine, $\frac{1}{150}$ grain of atropine, and $\frac{3}{4}$ grain of cocaine hydro-

chlorate, may be injected preparatory to aspiration.

The patient is placed on the sound side, and the arms folded over the chest, so as to draw the scapulæ away from the vertebræ. This affords a safe method of selecting the interspace between the sixth and seventh rib in the posterior axillary line. It may be found at the extreme angle of the scapula, and with a space comparatively free from muscles, where the ribs are some distance apart. The most expedient course, however, is to count the ribs also, and to have a needle at least three inches in length which is attached to a Potain or Dieulafoy aspirator.

The most dependent portion of the collection should be selected in small accumulations.

The diaphragm has its lowest attachment behind at the twelfth rib and on the sides about the ninth or tenth, but the collection of pus may be incapsulated so as to present definite indications for puncture as low as the eighth intercostal space in the middle axillary line; behind this point, we may find the ninth intercostal space clearly dull, from fluid. In such cases the area of pulmonary resonance on the sound side should be carefully noted as a comparative guide.

The diaphragm has been shown to be higher, if possible, in some cases of empyema, on the affected side, than on the sound side. The organ will rise when the compression is removed; hence the advice of Stokes to go above the eighth interspace in cases of resection, incision, or puncture.

The sixth interspace in the midaxillary line or the eighth in the posterior axillary line near the border of the latissimus dorsi muscle and at the angle or point of the scapula is the point of selection of F. S. Dennis. The advisability

of the three operations (thoracentesis, thoracotomy, thoracoplasty) depends upon the age of the patient, the character of the fluid, and especially, in the latter, upon the fact that it may be a life-saving operation. (Roswell Park.)

INCISION.—It is advisable to have all in readiness in cases where empyema is suspected, and an exploratory puncture or aspiration is made, to incise at this point should pus be found to exist.

Chloride of methyl, applied for not more than three seconds at a time, may be used in incision for empyema. Berezovsky (*Brit. Med. Jour.*, Sup., Aug. 1, '91).

Neither ether nor other form of anæsthetic ever used in any of the author's cases of tapping the chest. The operation is not attended with much pain and is quickly done, and an anæsthetic is dangerous. In the case of children, ice as a local anæsthetic is sufficient. A self-retaining silver cannula is most satisfactory. Thomas G. Morton (*Annals of Surgery*, July, '95).

Especially is an incision necessary in cases where numerous punctures have been necessary to find the pus. It should be made where the needle is and before it is withdrawn. A groove may be made in the needle of the aspirator, as suggested by Kebbel, so that the blade can be started from this exact point as guided to the pus by the groove. All such incisions should be near the upper border of a rib.

There are five classes of cases in which surgical interference is to be considered:

1. Large cavities in which the lung, fastened to the vertebral column by thick false membrane, is entirely and permanently collapsed. In these cases the operation is useless and dangerous.
2. Large cavities in which the lung, though condensed, still preserves a slight vesicular murmur. Intervention is then sometimes useful, particularly in young patients and when the cavity does not extend beyond the third rib.
3. Cavities from eight to twelve centimetres in

diameter; these present the most favorable conditions for cure. 4. Simply fistulous tracts of greater or less length; if short and straight, the results will probably be good; the prognosis becomes less favorable when the fistulæ are long and tortuous. 5. Cases in which there are moderate-sized cavities with fistulous tracts communicating with them; in these the prognosis is favorable. Bouilly (*Revue de Chir.*, Apr. 10, '88).

The method of simple incision in the intercostal space parallel with the ribs has been sufficient often to allow a drainage-tube to be inserted, and in this way many have found that the resection of ribs is unnecessary.

Incision far back—in ninth better than sixth intercostal space—recommended. Wounding of diaphragm easily avoided by making incision layer by layer. The lower intercostal space does not retract like the upper; the issue of fluid is assured in the prone position. Moty (*Bull. Méd. du Nord*, June 14, '95).

Drainage can best be accomplished in the axillary line, notwithstanding the amount of muscle and fascia. Holmes (*Cook County Hospital Reports*, July, '90).

After making an incision down to the pleura or removing a portion of a rib subperiosteally, the author plunges a trocar and cannula into the pleural cavity. Through this cannula he introduces a tube filled with an antiseptic solution and connected with an aspirator. The pus is then removed and the pleural cavity washed out with a sublimate solution. After this the tube is cut off at the level of the mouth of the cannula, and a hard-rubber tube, one centimetre long, is inserted; this tube has a valve at the inner end, which closes at each inspiration, but opens on expiration to allow escape of pus and prevent the entrance of air. Rochelt (*Wiener med. Presse*, Nos. 32, 38, '87).

In children incision and drainage in the majority of cases are quite sufficient. Two deaths in thirty-four personal cases. Morison (*Lancet*, Sept. 29, '94).

Free incision when done early is very

successful; the removal of a portion of a rib is never necessary in acute cases, and a fatal issue at any age is rather a result of the neglect to recognize the true nature of the case than of the operation itself. Lewis Marshall (*Lancet*, Dec. 21, '95).

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Simple incision of the chest-wall, thoracotomy, may be employed, the site of the incision being determined according to the position of the collection of pus. An opening in the lowest part of the pleural cavity is not the most suitable. It is not advisable to wash out the cavity, at the time of operation at all events; such a procedure is not devoid of danger. The more efficient way of treating an empyema, especially in children, is to incise and remove a portion of a rib. A. Primrose (*Canadian Pract.*, Mar., '96).

Below the age of 23 it is unnecessary in empyema to remove portions of ribs, but above that age it is essential in order to insure contraction of the abscess-cavity. In urgent empyema it is best to use no chloroform, but to freeze the skin with chloride-of-ethyl spray. In patients above 23 portions of ribs may be removed whenever the breathing is sufficiently relieved to bear chloroform. J. C. Renton (*Practitioner*, Jan., '96).

Empyemata healed by expansion of the lung, ascent of the diaphragm, and contraction of the chest-wall. In all recent cases there is more or less complete re-expansion of the lung on the withdrawal of the pressure which has been exerted by the fluid. Full expansion in the lung should, therefore, be maintained at the time of the operation. J. E. Winters (*Prac. Med.*, Mar., '96).

Valved tube successfully used for draining the pleural cavity after incision in empyema, with the object of preventing the falling in of the chest-wall and diminished expansion of the lung. W. M. Hutton (*Lancet*, London, Feb. 6, '97).

Alfred Sheen, of Cardiff, Scotland, has been successful in securing permanent cures by the method that we have outlined above, and the consensus of opinion

seems to be that the most radical measures are not indicated. When resection is practiced, a small-sized piece of rib, sufficient for one drainage-tube, has been found to answer all the purposes of drainage.

The most important and at the same time the most ingenious operation devised to accomplish this has been by Dr. Carl Beck, of New York. He uses an elevator by which the rib may be cut and denuded of periosteum at the same time. The indication for the operation is, of course, in children, or those patients in whom a drainage-tube could not be inserted between the ribs. The indorsement of John Ashhurst, of Philadelphia, is very strong in favor of operative interference in cases of empyema, and the mortality he reports is especially small.

The practice of incision and drainage, of resection of ribs with the insertion of drainage-tubes, of the siphon-apparatus introduced by Büllau, all subserve the purpose intended.

Even if the operation for empyema does not effect a cure, it does not make the patient worse. In the large majority of cases operations give great relief, and in a certain proportion, particularly in the young, they give a perfect cure. Very rarely do they cause death. J. Ashhurst (*Internat. Med. Mag.*, June, '94).

Thoracotomy performed in 76 cases of empyema, of which 89 per cent. were cured; about 71 per cent. were able to work within two months. The point of election for the incision is the lateral surface of the thorax, just below the axilla, selecting the fourth, fifth, or sixth rib. A tube carried in at such point will always enter the free cavity, and, with the patient in the proper lateral position, allow the pus to flow out, a portion of the rib, about $1\frac{1}{10}$ inches, being previously removed. If disinfectant washes are indicated, salicylic or boric acid solutions are preferred. A bandage covering the whole thorax is

used, in connection with special movements of the body and rest in bed on the side, inclining to the back. Koenig (Pittsburgh Med. Review, Oct., '91).

Costal trephining is simple of performance and harmless. Preferably performed on eighth and especially ninth rib in widest portion, posteriorly seven centimetres from costal angle. Crown of trephine one centimetre in diameter. Several openings may be made, either in the same or adjacent ribs. Rey (Lyon Méd., June 23, '95).

In operating for empyema in children, circumscribing of the inferior and posterior borders of the healthy lung advised, followed by resecting, on the diseased side, the rib situated two or three centimetres above this limit, near the vertebral column. Schultz (Jahrb. d. Hamb. Staatskr., vol. xiii, p. 260).

Literature of '96-'97-'98.

Case of subphrenic abscess followed by empyema successfully treated by resection of a rib, drainage, and packing. McNaught (Brit. Med. Jour., May 22, '97).

Generally speaking, the case should be a law unto itself, and the surgical means at our command should be accompanied by early out-door exercise and gymnastic performances, especially in children and young adults. The deformity sometimes following the operation may be treated by Sayre's jury-mast, and by the ordinary remedies and measures for scoliosis.

SKYPHOSIS OR LORDOSIS.—Since 1883, Dieulafoy has practiced thoracentesis 180 times on 69 hospital patients and 200 times in his private practice, and never once has he seen the liquid become purulent after the operation. Whenever the liquid reached 1800 grammes (60 ounces) thoracentesis was imperative.

Treatment by irrigation of the pleural cavity is severely condemned by most authorities.

The danger in irrigation lies in the fluid employed or in the sudden and

marked increase or decrease in the intrathoracic pressure. Basel (Med. Chronicle, Aug., '87).

Irrigation is not always without risk, as there are a number of cases on record in which sudden deaths occurred during its employment. G. T. Robertson (Med. Chronicle, July, '88).

Cases in which cerebro-spinal symptoms occurred during treatment by irrigation. Paget (Lancet, May 4, '95).

[The employment of irrigation in the cavity of the chest after the removal of purulent collection by incision or otherwise is a precarious measure. Even sterilized hot water has been attended with marked vital depression, amounting in some cases to collapse. The introduction of iodoform with glycerin by swabbing over the surface or upon gauze tampons within the pleural cavity is not attended with the inconveniences of general irrigation, and proves more effective in correcting septic development. J. McFADDEN GASTON, Assoc. Ed., Annual, '96.]

Literature of '96-'97-'98.

Number of cases of empyema with fistula treated by warm baths. If the fistulous opening is below the level of the fluid, it is evident that if the patient inspires and expires freely there will be a current of water into and out of the pleural cavity much stronger than can be obtained by simple irrigation. Clumps of coagulated blood and fibrinated masses are by this means washed out which could not have been obtained by simple lavage. The baths were given in boiled water cooled to the temperature of the body, and lasted ten or fifteen minutes. The general condition of the patients was much improved, and no accident was observed to follow this treatment. Zeman (Rev. de Thér., May 1, '97).

Case of empyema in a child successfully treated by irrigation by submersion, according to Zeman's method, after resection. S. S. Adams (Pediatrics, July 1, '98).

Authors agree in the following dangers in aspiration or irrigation of the

pleural cavity, viz.: Hemiplegia, following cool solutions; death following aspiration; fatal results also in cases of the use of an anæsthetic; unusual depression from the sitting posture during aspiration, relieved by assuming the reclining position. The cautions given have been to use warm solutions, or, better, no solutions at all; and to stimulate with cognac, strychnine, etc., previous to thoracentesis.

[Richard H. Harte, of Philadelphia, has never had an unpleasant result from washing out an old empyema: but it must be remembered, he says, that a considerable number of cases are on record in which an injection, which may have been frequently repeated without serious consequences, has led to sudden death, or to the most alarming symptoms, probably from the sudden increase of pressure within the cavity, caused by a partial closing of the outlet or by the use of too large a tube. The nature of the fluid employed can have had nothing whatever to do with these results, as equally bad results have followed the use of pure water. ("International Encyclopedia of Surgery," Ashhurst, vol. vii, Supplement.)

These results emphasize the risks attending intrathoracic irrigation. J. McFADDEN GASTON.]

INTERLOBAR PLEURISY.—This form is best treated by the excision of the fifth and sixth ribs, as shown in examples treated by Segond and others. The surgeons who have discovered interlobar pleurisies in time for treatment have generally made their resections too low. The autopsies in some cases showed Rochard's former statement correct in regard to their location.

Most published cases have recovered without operation, the pus having been expectorated.

Case operated on in which death occurred some days later, the pus being found between the lobes of the right

lung. Gerhardt (Brit. Med. Jour., Sept. 9, '93).

CASES OF LONG STANDING with fistulæ, deformity, and great rigidity of the costal walls, may require what is known as the Letiéviant-Estlander operation, an operation first suggested by Letiéviant and practiced by Estlander. The operation has been variously applied to any resection of ribs for the purpose of the approximation of the walls of the chest. The most important distinction to be made, however, is that originally the operation included more than one rib and several inches of length in the resection.

[Frederick S. Dennis has awarded the credit of the first suggestion of resection of the ribs to Dr. Warren Stone, of New Orleans, while Dollinger (Annual, '90) and others state that Letiéviant first suggested it.

The two suggestions were probably original so far as each of the above surgeons were concerned. Many operations have been done in this way, as seen in the case of W. W. Keen. J. McFADDEN GASTON, JR.]

The operation of Schede consists in the complete removal of the muscles and tissues adherent or attached to the ribs, with the exception of the skin, the fascia, and the parietal pleuræ, and these are stitched together and form the only protection to the chest at the point of the operation, and the only hope of restoring the tissue lies in the granulating process.

The incision is a U-shaped one, extending from the axilla in front downward to the limit of the pleura and backward and upward to the second rib, lifting the scapula in the removal of the bony flaps. This operation has been advised as a modification of Estlander's operation, in cases where the pleura is much thickened and where the walls fail to respond to ordinary means of reducing the cavity of the chest.

Estlander's operation—which consists in removing, not only a certain length or a certain number of ribs, but all the ribs lying in the wall of the empyema—performed twelve times, the results being nine cures and three deaths, one from tuberculosis, the second from car-

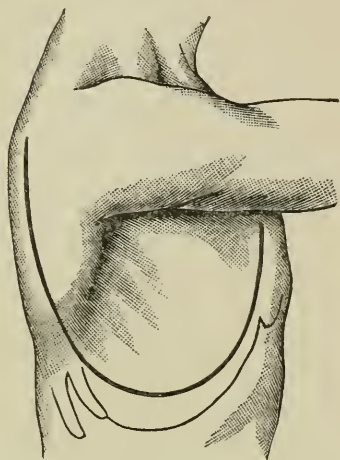


Fig. 1.—Schede's incision for thoracoplasty. (Keen.)

diac disease, and the third from albuminuria. J. Boeckel (*Revue Chir.*, Apr. 10, '88).

Extensive thoracoplasty by Schede's method performed in a case of thoracic empyema of twelve years' duration. Second operation performed three months after first. Recovery was without incident, though slow. Eight months after the second operation the wound broke open again and discharged a small quantity of pus. By a third operation some more of the chest-wall at the upper posterior angle was removed. A cavity three and one-half inches long and as thick as the thumb was found. This was nearly obliterated by granulation-tissue. W. W. Keen (*Annals of Surgery*, June, '95).

One hundred and twenty-nine cases of empyema treated by resection of the chest-wall, in which 56.3 per cent. were healed, 20 per cent. improved, 3 per cent. unchanged, and 20 per cent. died. There

is little or no tendency to spinal curvature or to impairment of function of the corresponding upper extremity following these operations. Voswinkel (*Deut. Zeit. f. Chir.*, B. 45, S. 77).

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Deformity observed resulting from removal of the fourth, fifth, sixth, and seventh ribs. This consisted of a large depression of the whole left side, beginning about two inches below the clavicle and extending below the free border of the ribs. There was a marked degree of lateral curvature. L. Emmett Holt (*Archives of Ped.*, Jan., '96).

In the treatment of empyema success obtained by removing the whole of the chest-wall covering the cavity (Schede) and breaking up and loosening of the contracted pleuræ (Delorme). Jordan (*Med. Rec.*, May 14, '98).

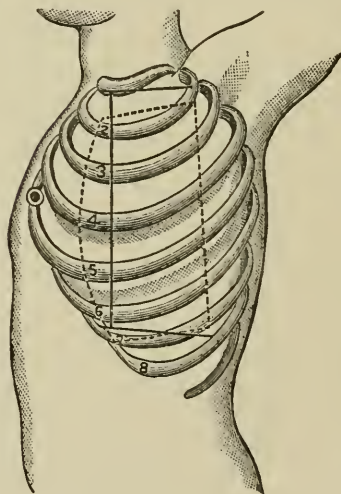


Fig. 2.—Schede's incision for thoracoplasty. The solid line shows the incision made by Keen. The dotted line shows the portion of the bony and muscular chest-wall removed. The posterior line should be farther back. (Keen.)

Extensive resection of ribs should be resorted to in only the most desperate cases. Rafferty (*Med. Rec.*; *Canada Lancet*, July, '98).

Christian Fenger, of Chicago, holds that there are certain cases in which Schede's operation is required; viz., after milder measures, such as incision, drainage, and Estlander's operation have been fruitlessly employed. He reported a successful case in which this operation was performed after other measures had been unsuccessfully resorted to during seven years.

Roswell Park, of Buffalo, states that the treatment of empyema should be based upon the same principles as are applicable to other abscesses. In acute cases presenting streptococcic and staphylococcic suppuration it may be sufficient in a few instances to simply aspirate. A summary of the treatment to be employed in cases of empyema may include the following features:—

(a) Prophylaxis.

1. Care should be taken to jugulate, if possible, all cases of incipient pneumonia, pleurisy, and bronchitis.

2. All penetrating wounds of the chest, whether from gunshot wounds or stab wounds, should be hermetically sealed.

3. Collections of blood-serum or air may be evacuated early by aspiration.

4. Children should be carefully examined in cases of continued fever, sweats, and hectic, and prompt measures taken to remove the possibility of purulent collections, by exploration.

(b) Operative treatment.

5. Incision and drainage.

6. Trap-door for exploration in cases of tuberculous deposits of caseous material.

7. Estlander's operation for the old and stubborn cases of fistulous empyema.

8. Schede's operation for thickened pleuræ, and resistance to the recourse to Estlander's operation or to Delorme's,

Quénu's, or Gaston's modifications of flap-operations.

9. Iodoform or plain sterilized gauze tamponage for stimulating the granulation and securing constant drainage.

10. Permanganate-of-potash solutions for offensive discharges.

PULSATING PLEURAL EFFUSIONS.—

The term has been recognized for an empyema occurring, according to Tillmans, almost entirely on the left side. There have been sixty-eight cases collected, and



Fig. 3.—Result eight months after operation. (Keen.)

these have occurred in the hands of a few men. The only mistake that might prove fatal could be to open a thoracic aneurism, thinking that it was an empyema. The general indications of empyema may be conclusively corroborated by an exploring needle or aspirator. The treatment is the same as in any ordinary case of empyema.

TUBERCULAR EMPYEMA. — A large proportion of the cases of empyema are essentially cases of cold abscess, or, more

properly, tuberculous abscess. In these, free incision, free drainage, and excision of a rib are required. Park has resorted to scraping with the sharp spoon, and in some he has cauterized the diseased surface with a 50-per-cent. solution of zinc chloride. In several cases death would have occurred had it not been for some such radical operation.

In advanced tubercular cases operation is contra-indicated. Fräntzel (Schmidt's Jahrb., Aug. 15, '88).

In tuberculous cases radical operation indicated—thoracotomy with resection—if exploratory puncture show bacteria of suppuration. If there are no bacteria of the suppuration, aspiration advised to relieve pressure and allow the lung to expand. If the case is of long standing, and the compressed lung is inexpandible, palliative measures are indicated. Baumbler (Deutsche med. Woch., Nos. 37, 38, '94).

Tuberculous purulent pleurisy has been cured by thoracentesis followed by injections of corrosive sublimate and boric acid through the same needle (or cannula) of a Dieulafoy or Potain aspirator.

Case of tubercular empyema in which, after pleurotomy was performed, the pleural cavity was repeatedly washed with chloride of sodium, 5 drachms; sulphate of sodium, 15½ grains; distilled water, 1 quart, with the result that a complete cure was effected in the course of two months, not even a trace of a fistulous opening having remained. H. Dubief and A. Bolognesi (Bull. Gén. de Thé., Aug. 30, '94).

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ENCEPHALITIS. — Gr., ἐγκεφαλίτις, the brain, and *itis*, inflammation.

Synonyms. — Encephalitis; cerebritis.

Definition.—Inflammation may attack any portion of the brain, and in some

cases nearly the entire brain is affected. It is probable that general inflammation of the brain never occurs, death ensuing before the inflammatory process invades the whole brain. Usually the inflammation is confined to a more or less circumscribed area in one lobe, but quite frequently it involves an entire lobe, less frequently all of one hemisphere, or large areas of both hemispheres; also it may exist as isolated or disseminated foci throughout the organ. No age of life is exempt from it, and a prenatal form is described. It is also frequently associated with meningitis.

Encephalitis may cause acute or chronic softening, the formation of pus, and complete disintegration of affected parts of the brain; or it may cause an acute or chronic hardening of the brain, with or without atrophy, and, in certain rare cases, hypertrophy may exist. It is thus seen that the term encephalitis covers a wide range of clinical cases, and includes in its symptomatology an almost-endless combination of symptom-groups, which depend for their association upon the nature, grade, extent, and location of the inflammation within the encephalon, as well as upon many concomitant conditions which may exist in the patient. All of the symptom-groups have, however, usually some common characteristics, and, while accuracy in diagnosis is probably nowhere else more difficult, in many of the cases certain types of encephalitis have been described which show considerable uniformity. In the consideration of the subject it seems better to classify the cases upon what we know of their pathology, meagre as this often is, than to use the many etiological synonyms so frequently found in the older descriptions. In the present state of our knowledge certain terms commonly used are

misleading to the student. This applies to the terms *polioencephalitis superior* and *polioencephalitis inferior*, introduced by Wernicke, and also to the polioencephalitis of Strümpell. These terms are widely used to denote some well-known types of focal encephalitis; but, since more recently many cases have been reported in which focal encephalitis involved both the gray and white substance, it would seem that such synonyms as proposed by Wernicke and Strümpell only serve to confuse, as remarked by Mills in his recent excellent work upon diseases of the nervous system. Encephalitis is often associated with meningitis, and the term "meningo-encephalitis" is applied to inflammation of the membranes and subjacent brain-cortex.

Varieties. — For convenience of description encephalitis may be classified as follows:—

I. Acute non-suppurative encephalitis.

- (a) Focal.
- (b) Diffuse.
- (c) Disseminated.

II. Acute suppurative encephalitis.

- (a) Focal or circumscribed (abscess), single or multiple.
- (b) Diffuse.

III. Chronic encephalitis.

- (a) Terminal stages of cases arising acutely, but resulting in chronic cerebral lesions.
- (b) Chronic meningo-encephalitis.
- (c) Chronic softening due to encephalitis.

IV. Prenatal encephalitis.

Acute Non-suppurative Encephalitis.

Acute non-suppurative encephalitis occurs most frequently in infancy and childhood, but may occur at any age.

Since the paper of Strümpell in 1884 much interest has been awakened in the whole subject of cerebral inflammation, and a considerable number of cases have been reported in which the autopsies have proved beyond doubt the existence of acute non-suppurative encephalitis as a distinct, primary affection. By some authorities it is held that acute non-suppurative encephalitis during foetal and infantile life is the prime factor in the etiology of a considerable proportion of cases of chronic degenerative diseases of the brain, including infantile cerebral paralysis, disseminated sclerosis, and bulbar paralysis. Observations, recorded since 1884, upon cases presenting the symptoms of acute encephalitis, tend to confirm this view; and it seems to be fairly established that acute encephalitis quite commonly leaves residual affections, especially motor and psychical in character. Certain writers have affirmed a special tendency of acute non-suppurative encephalitis to attack the motor regions of the brain; but this may be only seemingly so, because of the great difficulty of observing defects of the special senses in children. While there are, undoubtedly, certain areas which, when they present an acute inflammation, give us more typical signs of its presence than do many of the so-called "silent regions" of the brain, one cannot review the post-mortem records, meagre as they still are, without concluding that acute inflammation attacks quite impartially the gray and white matter, the cortex and basal ganglia, the lining membrane of the ventricles, and the enveloping membranes of the encephalon.

Two forms of acute non-suppurative encephalitis may be said to exist clinically, according to the extent and distribution of the inflammatory process.

Acute focal non-suppurative encephalitis means a more or less circumscribed area in one lobe, or a number of inflammatory foci grouped together in one lobe or region of the brain.

Acute diffuse non-suppurative encephalitis may affect an entire lobe or hemisphere, or both hemispheres.

Acute disseminated encephalitis is so rare an affection that no clinical type can be described.

Symptoms.—The symptoms of acute non-suppurative encephalitis vary in their character according to the extent and intensity of the process, the cause producing the inflammation, and the particular region affected. In certain cases, however, the post-mortem examination failed to reveal lesions commensurate with the symptoms during life, and the conclusion has been reached that, especially in those cases of acute non-suppurative encephalitis following influenza, typhoid fever, and the acute infections generally, there is a *toxic element* which not only intensifies the symptoms due to organic lesions also present, but is capable of causing a fatal termination in cases which after death may show comparatively-slight lesions. This intensification of the symptoms due to the primary toxæmia, may explain the rapid and complete recoveries which at times occur in the paralytic phenomena in such cases. Few cases, however, pass through an attack of acute encephalitis without some lasting mental or physical defect. The symptoms of acute non-suppurative encephalitis will be described according as the disease is *focal* or *diffuse*, although they have many symptoms in common.

(a) Acute focal non-suppurative encephalitis occurs most frequently in children, but cases are reported in adults, especially after influenza, and in alco-

holics. The onset is usually sudden: after or during an attack of some acute infectious disease of childhood, or after influenza, diphtheria, typhoid fever, or, more rarely, after traumatism; there are headache, vomiting, fever, convulsions (single or repeated), irritability, and restlessness, with a tendency toward hebetude, or stupor. There may be an initial chill, or repeated chilly sensations may be complained of by the patient. When the disease arises during the course of some acute infectious disease the significance of the symptoms may be easily overlooked, or attributed to meningitis, until some form of paralysis makes the nature of the case clearer. The typical case, however, runs a more or less irregular course. Drowsiness is usually an early and a very characteristic symptom, and this encephalonarcosis may persistently deepen, especially in rapidly-fatal cases, or it may alternate with periods of restlessness and delirium. In nearly all cases mental obtuseness is present, and in some cases there is also marked confusion of ideas, which may persist after the acute symptoms have passed away. The convulsions may be toxic or chronic, local or general, and are not characteristic of anything, during the acute stage, except as denoting a cerebral irritation. Rigidity of the spinal muscles and opisthotonos may occur, but the latter is much less frequent than in meningitis. The fever runs a moderate course, rarely exceeding 103° F. and subnormal variations are not uncommon, especially during the comatose states, which generally supervene rapidly after the acute onset. During the acute progress of the disease some form of paralysis may be noticed, or it may be almost the first sign in certain cases (see case reported by Putnam in the Journal of Nervous and

Mental Diseases, '97), which begin usually less acutely than these cases occurring in connection with the acute infectious diseases. In other cases occurring during the height of an acute infectious disease, the paralysis may remain unnoticed until convalescence is well established, and the diagnosis of the case thus disclosed. The paralysis may take any form, and sensation may be affected, although few observations of this kind are on record. The paralysis may or may not be attended by spasm of the affected muscles. Atrophy is usually of limited degree when present at all, and Spitzka has observed hypertrophy of certain paralyzed muscle-groups. The location of the inflammation determines the form of the resulting paralysis. In the type of acute encephalitis described by Strümpell in 1884, and considered by him as strictly analogous to infantile poliomyelitis and the bulbar type of polioencephalitis described by Wernicke, it has since been found that the lesions quite commonly involve the white substance as well as the cortex. For this reason the writer concurs with Mills that the term "cortical encephalitis," while true of certain cases, is not as good as focal encephalitis, which can include all of these acute intracerebral inflammations, whether cortical, subcortical, or basal in location.

The sequelæ which have been noted in cases of focal encephalitis include paralysis, with or without spastic conditions; contractures, atrophy, epilepsy (often Jacksonian), hemichoreas, hemiathetosis, peculiar associated movements, and imbecility, all varying in degree according to the location, extent, and severity of the inflammation. When the process is confined chiefly to the cortex, the resultant paralysis may be monoplegic, hemiplegic, paraplegic, or di-

plegic, according to its extent. If ophthalmoplegia is present, which is sometimes associated with some degree of facial paralysis, the inflammation is usually found to involve the gray matter of the floor of the fourth ventricle, the aqueduct of Sylvius, and adjacent structures. This form corresponds to the polioencephalitis superior described by Wernicke, Thomsen, and others. Another form also described by Wernicke and termed by him "polioencephalitis inferior" has labio-glosso-laryngeal paralysis as the chief clinical characteristic. In some cases of the latter form ophthalmoplegia may develop during the progress of the disease. The lesion of polioencephalitis inferior has been found in the motor nuclei of the post-oblongata and adjacent nerve-roots.

Some cases of acute focal encephalitis may begin insidiously, with very slight febrile reaction and gradual development of paralytic symptoms.

Case in which after slight fever "external ophthalmoplegia, cycloplegia, iridoplegia, and ptosis with diplegia facialis" and muscular inco-ordination developed within a period of two weeks, and after a course of ten days resulted in progressive and perfect recovery. Wolfe (Jour. of Nerv. and Mental Sci., '94).

This type of case is far more frequent in adults than in children, and corresponds exactly to the description by Wernicke of polioencephalitis superior acuta, with the exception that recovery ensued. Interesting cases of analogous symptomatology have been reported by Putnam and others, but our knowledge of the affection is mainly from the studies of German observers, including Strümpell, Wernicke, Oppenheim, Nauwerck, Brie, Freyhan, and others.

Very instructive case in a woman of 36, who exhibited loss of appetite, abdominal pain, slight fever, hebetude,

rigidity of neck-muscles, dilatation of one pupil, coma, and death, with increased temperature. The post-mortem examination revealed numerous foci of hæmorrhagic softening throughout the substance of both cerebral hemispheres. Brie (*Allg. Zeit. f. Psych.*, B. 53, p. 604).

This type is frequent among the reported cases.

[Nauwerck has reported several cases, one of which illustrates how rapidly fatal the disease may be. The patient in this case was a girl of 19, who presented the following symptoms: Headache, an unsteady or staggering gait, faintness, vomiting, loss of pupillary light-reflex, slow pulse, fever, hebetude with restlessness, and death on the following day. The autopsy revealed a focal encephalitis, surrounded by a zone of acute softening, and a bacillus identical with the bacillus of influenza was found in the lesion and also in the ventricular fluid. C. M. HAY.]

The symptom-group described by Strümpell differs from the Wernicke form of focal encephalitis in that paralysis of the external eye-muscles is present in the latter as a prominent symptom, and optic neuritis is far more commonly present. The other general motor disturbances, with impairment of speech, may be identical in the two forms. When ocular-nerve palsy is associated with polioencephalitis,—cases of which have been reported by Rothenthal, Seeigmüller, Guinon, Sachs, and others,—the affection is termed polioencephalomyelitis. It is extremely rare, does not occur in childhood, and runs a more or less subacute course.

These differing forms of acute focal encephalitis which have been referred to illustrate the chief clinical types of the disease. The most common of them is that occurring in infancy or childhood, after or during one of the acute infectious diseases. The next type in fre-

quency is that occurring in adult life as a result of the poison of influenza, chronic alcoholism, or without apparent cause. The least frequent is the type due to traumatism, which more frequently causes a diffuse inflammation.

The part played by acute focal encephalitis in the etiology of the cerebral palsies of children is a question of much interest, and is as yet wholly undetermined. Osler believes that certain of the cases of sclerosis and porencephalus may be due to infantile meningo-encephalitis, and thinks that the views advanced by Strümpell have not met with the consideration which they deserve. J. Lewis Smith suggests that certain cases of infantile hemiplegia are due to cortical encephalitis induced by the toxin of cerebro-spinal fever. Jacobi favors the view that some cases of cerebral palsy in children, disseminated sclerosis, and bulbar paralysis are results of prenatal or infantile primary inflammation of the brain. The exact relationship, however, between acute focal encephalitis in early life and these forms of paralysis still awaits further pathological evidence.

It will be noticed that the symptoms of acute focal encephalitis are practically of the same character in the adult as they are in the child, although they are often less marked in the adult, and the residual paralyses and other affections above referred to are likely to be less severe. The reason for these differences in degree probably lies in the natural differences which exist between the comparatively poorly developed foetal and infantile brain as compared with the matured organ. The brain, being the last organ to develop, during infantile life is softer and relatively more vascular, due to the larger proportion of water it contains; therefore it is not surprising that acute inflammation is

far more frequent in infancy and childhood than during any other period of life.

(b) Acute diffuse non-suppurative encephalitis presents symptoms which in the acute stage closely resemble those attending the focal variety. They will, of course, vary with the location, extent, and severity of the inflammatory process. It occurs at any age of life, but the cases are more numerous below the age of twenty, according to the statistics of Knaggs and Brown. This form of cerebral inflammation may be rapidly fatal, or it may run a subacute course, finally ending in a chronic condition. Complete recovery is exceedingly rare, but partial recovery is not uncommon. It occurs most frequently after traumatism, as the exciting cause. The cases occurring in adult life are commonly due to alcohol, syphilis, or traumatism. Cases also occur in which it is impossible to assign a definite cause; but it is probable that, as infection is an important cause of focal encephalitis, it is also a more or less frequent cause of the diffuse form of the disease. Although there is little regularity in the appearance of its symptoms, the onset of acute diffuse non-suppurative encephalitis is apt to be marked by dull or boring pain in the head, fever with delirium or stupor, local or wide-spread muscular spasm, and some form of paresis rapidly increasing to paralysis, usually spastic in character. Mental hebetude, or torpor, appears early, and throughout the disease is a very marked feature. The reflexes are increased in the paralyzed parts. Sensation is affected according to the seat of the lesion. The temperature may be subnormal on the paralyzed side in hemiplegic cases. Optic neuritis, which may be present, is not so frequent as in suppurative meningitis or enceph-

litis. Localized muscular tremblings frequently occur early, and may be the first symptom. These spastic movements may affect any portion of the body, but more frequently one arm or the muscles of the face and neck. Cases are reported in which there has been incessant spasm of the facial muscles, the tongue, the ocular muscles, and the muscles of mastication. With these spastic features general convulsions may occur, which may be repeated. The pupils are contracted or unequal. If the patient survives the acute stage, apathy and stupor become more marked. On arousing the patient great mental degeneration is apparent. The evacuations are voluntary. The temperature falls and a subnormal range is common. The disease runs a course of from a few hours to five or six weeks. Most cases run several weeks. Some cases partially recover and continue to live with chronic conditions of paralysis and mental disease. Certain cases of acute delirious mania exhibit post-mortem the lesions of an acute diffuse non-suppurative encephalitis.

(c) Acute disseminated non-suppurative encephalitis has no distinct clinical existence. It may occur as a result of syphilis, or during the course of the acute infectious diseases, as typhoid and typhus fever, erysipelas, scarlet fever, diphtheria, small-pox, influenza, septicæmia, and pyæmia. Pathologically, small foci of inflammation appear quite early distributed throughout the brain. Colonies of micrococci have been found scattered throughout the brain. This condition has been termed *mycosis* of the brain. The symptoms produced by these lesions must vary indefinitely with their number and distribution. The cases reported are too few to base any clinical description upon.

Although acute non-suppurative en-

cephalitis has been established as a clinical type by the studies of many well-qualified observers, its etiology is still largely a matter of speculation. It is true that we know something of the conditions favorable to its development, but why the affections which give rise to it at times are not more frequently followed by this disease, when it is considered that they are very common diseases, is hard to explain. It can be stated that at present we are almost wholly ignorant of its primary causative factor, and the exact mode of production of the inflammatory lesions.

Etiology.—Acute non-suppurative encephalitis in its focal manifestations most frequently occurs in connection with some acute infectious disease. It may arise during the progress of the infective process, or days or weeks after convalescence has been established. The diseases with which it has most frequently been associated are influenza, the acute infectious diseases of childhood, typhoid fever, and diphtheria. Certain cases occur in which these infections are absent. This fact has been explained by some writers upon the subject as pointing to the probable existence of a definite toxin peculiar to the disease. Leichtenstern and Nauwerck believe that the focal-hæmorrhagic form of acute encephalitis may be of bacterial embolic origin. The latter observer, with Pfuhl and many others, think that the nervous symptoms may be the first sign of the infection. Traumatism may be a cause of both focal and diffuse encephalitis, but is far more frequently causative of the latter. The same may be said of alcohol and syphilis.

Acute non-suppurative encephalitis of all varieties is far more frequent under the twentieth year of life, and the majority of cases of acute focal encephalitis occur during infancy and childhood.

After the age of twenty alcohol, syphilis, traumatism, and the influenza infection are the chief causes recorded. It has also been known to follow sun-stroke.

Pathology.—The few autopsies which have been made in cases of acute non-suppurative encephalitis show in the acute focal lesions the presence of the ordinary appearances of acute inflammation of brain-tissue, and very commonly associated with numerous punctate hæmorrhages within the affected areas. The patches may be small, single or multiple, and either confined to a small portion of one lobe or more or less diffused throughout one region of the brain. Macroscopically the acute lesions are reddish gray in color, of diminished consistence, sometimes amounting to acute red softening, and are surrounded usually by an area of increased vascularity, showing lesser degrees of the inflammatory process until normal brain-tissue is reached. In some cases the process is sharply defined, but no distinct limiting membrane has been described. The hæmorrhages, which are common in these cases, are usually small and punctate in form, but may be large and attended by disintegration of the brain-tissue in their immediate neighborhood. Microscopically these lesions present the evidences of an exudative inflammation. The vessels are seen to be ruptured here and there, an exodus of leucocytes is seen especially marked about the vessels and often distending the perivascular lymph-spaces, while granular cells are apt to be present.

Upon microscopical examination in acute cases of this kind, aggregations of large round or angular epithelioid cells constantly found; these cells exhibit a great tendency toward fatty degeneration. Friedmann (*Neurologisches Centralblatt*, Aug. 1, '90).

The parenchymatous changes are probably secondary to the vascular lesions, and broken-down cells and disintegrated nerve-fibres are seen when the inflammatory process has progressed far enough to destroy these elements. The rôle of the infecting microbes in the cases arising from infectious diseases is still a question. Whether they operate directly from the blood upon the tissues or whether the lesions are due to some toxin generated by them is undetermined. When basal structures are attacked, the cranial-nerve roots have been found to be affected by inflammatory changes resulting in degeneration or softening. The membranes are frequently implicated when the inflammation is cortical, and may present bright-reddish patches due to distended vessels and minute hæmorrhages.

The post-mortem appearances of the diffuse form of acute encephalitis do not differ markedly from the localized form except in the greater extent of the lesion. During its acute stage there are the same macroscopical appearances and the brain is softened. In some cases, in which the inflammatory reaction is less severe and of longer duration, the brain undergoes hardening, which may involve a lobe or an entire hemisphere. In these cases of diffuse inflammation implication of the membranes is not uncommon. In most cases of diffuse encephalitis some degree of softening is the rule. Microscopically during the acute stage the vessels are dilated, capillary hæmorrhages are frequent, and the brain-tissue is infiltrated with leucocytes, which also distend the perivascular lymphatic sheaths. Compound granular cells appear, with secondary degenerative changes in the nerve-cells and axis-cylinders, with active proliferation of the neuroglia. This process progresses at times

until the nerve-elements are more or less completely destroyed in the affected area. In cases where hardening takes place both gray and white substances may be involved, but it has been especially marked in the white substance. Pathologically, the hardening is due to increase of the connective tissue, especially the vascular connective tissue. In one of the cases collected by Knaggs and Brown, the white substance of both hemispheres was found very much hardened, while the cortical substance was so soft as to be easily washed off by a stream of running water, giving the appearance afterward of a plaster cast of the encephalon.

Diagnosis.—The recognition of acute non-suppurative encephalitis during the period of its inception must, in nearly all cases, be attended with difficulty. This is particularly true of cases occurring in infancy and childhood, where it most frequently occurs as a complication or sequel of some of the acute infectious diseases. Very often it is not until the development of some form of paralysis that the disease is suspected to exist, and only the most careful study of each individual case can separate this affection from meningitis, with which it is, no doubt, frequently associated. This is especially apt to be true in traumatic cases. In all cases in which, during the progress of some acute general disease cerebral symptoms arise, in which, after a period marked by moderate signs of cerebral irritability, there results a paralysis out of proportion in severity with the general symptoms which might be expected to be present in meningitis, and, if other obvious exciting causes of the latter can be excluded, the presumption would be in favor of encephalitis. While no rule can be made with any degree of certainty, it is probable that

premonitory symptoms are far more common and last a longer period in meningitis before stupor and coma supervene. Photophobia, intolerance of light, and retraction of the head are often persistent in meningitis for days and even weeks before the stage of coma is reached. In all recorded cases of acute non-suppurative encephalitis the tendency to dullness, apathy, stupor, or coma is a marked and often early feature. The presence of optic neuritis favors meningitis, while its absence is wholly without diagnostic significance.

The best guide to a correct diagnosis, in cases where this is possible, between acute focal non-suppurative encephalitis and the different forms of meningitis is a careful study, not of any particular symptom-group, but of the entire case. There is no absolutely diagnostic sign by which they can be clinically separated, but a careful review of the onset, course, and succession of the symptoms will afford more valuable information than will any study of particular symptoms. Thus it will be borne in mind that both affections are very rare complications of the acute infectious diseases, but that meningitis is the more common; that any local source of septic infection, rheumatism with endocarditis, adjacent disease of the cranial bones, erysipelas, and septicæmia, more frequently cause meningitis; and that after traumatism meningitis usually develops at once or within two or three days, but the signs of encephalitis usually do not appear until considerably later. In this connection it may be mentioned that cases of acute encephalitis, from severe concussion upon the opposite side from the point of reception of the injury, have been reported.

In cases running a subacute course the decided mental deterioration with long

spells of extreme torpor or even semi-comatose states, and persistent spastic paralysis, have been the salient features of certain reported cases of diffuse non-suppurative encephalitis. Cases of spastic hemiplegia and diplegia in children quite frequently will give a history of an initial illness attended by convulsions, coma, and fever, and it is probable that a number of these cases arise from acute non-suppurative encephalitis during infancy. The same may be said of certain cases of disseminated sclerosis and bulbar paralysis. The trend of opinion seems to favor inflammatory lesions as causative of many of the chronic degenerative diseases of the brain met with in adult life. Further pathological proof is needed to establish the diagnostic features of acute inflammation of the brain in early life. In all cases of inflammation of the brain after traumatism the possibility of a non-suppurative diffuse encephalitis should be borne in mind. The diagnosis of the disseminated type can at present be little more than conjectural.

Prognosis.—The prognosis of any form of acute non-suppurative encephalitis is grave, both as regards life and the outlook for perfect recovery. In all forms many cases die during the acute attack. The prognosis of acute focal non-suppurative encephalitis depends, in great measure, upon the severity of the acute primary infection with which it is most frequently associated, and of which we must at present regard it as a resultant. Cases of perfect recovery from paralysis following this form of encephalitis are not uncommon, and the paralysis in these cases generally shows improvement for a year following the attack. After influenza, especially, this tendency to recover from apparently

grave conditions is marked. Very few cases, however, recover perfectly.

The prognosis of diffuse non-suppurative encephalitis in its acute form is very grave, both as regards life and recovery from residual lesions. There is almost no hope of complete recovery in any case. Cases having both hemispheres involved generally die within a few days. The majority of cases which run a subacute course may live a number of months, or with crippled intelligence and paralyzed bodies live for years. In general terms, cases of acute non-suppurative encephalitis, which begin abruptly, with decided fever, a rapidly-increasing comatose condition, and extensive paralysis are apt to be rapidly fatal; and, conversely, cases beginning rather insidiously, with slow development of symptoms, offer more hope of recovery. All grades of acute non-suppurative encephalitis are subject to irregularity in course and symptoms, so recovery sometimes occurs from apparently hopeless conditions; therefore an absolutely fatal prognosis should not be given in any case.

Treatment.—The treatment of acute non-suppurative encephalitis will vary somewhat according to the age of the patient, the previous state of health, and the existence or not of some acute infectious disease; but the same general principles which govern the treatment of acute simple meningitis apply to all of these cases; absolute rest in bed in a darkened and well-ventilated room is necessary in all cases. The head and shoulders should be elevated. Absolute quiet on the part of the attendants, and the exclusion of any source of mental irritation or excitement should be rigidly enforced. As soon as the existence of the disease is suspected, local depletion, by means of dry or wet cups or

leeches, applied to the nape of the neck or behind the ears, or to the temples; or general depletion by venesection in healthy sthenic adults with severe onset, should be practiced, followed in all cases by the ice-bag to the head. A fly blister may be applied to the occiput, and is better than larger blisters applied extensively over the head. When there is much hair the scalp should be shaved to admit of the fullest effects of dry cold. When vomiting is present small pieces of ice may be given by the mouth with sips of cinnamon-water at times, and a mustard plaster should be applied over the epigastrium; or a turpentine stoop may be used over the whole abdomen occasionally for this, and for its derivative effect. At the same time small and frequently repeated doses of mercury, preferably calomel, should be administered by the mouth, followed by a brisk purgative, and succeeded by the continued administration of smaller doses of mercury at longer intervals. In suitable cases aconite or veratrum viride may be given during the onset until their full physiological effect is secured, but in cases in children already weakened by disease they should be cautiously employed.

For the control of pain some form of opium is necessary, and where there is active delirium and marked local or general tremblings or irregular tremor, it may be combined with chloral and the bromides. The continuous application of dry cold should be maintained during the acute stage.

The diet should consist of milk or other light nutritious preparations in small quantities, and they may be predigested artificially with benefit. No stimulants should be given unless urgently demanded by the condition of the pulse. Cases demanding stimulation in

the early days of the disease may be given strychnine, supplemented by small doses of alcohol or ammonia in some form. The essence or wine of pepsin or champagne are acceptable stimulants to children, and are better borne by the stomach than whisky or brandy. If the patient cannot swallow, nutritive enemata should be given.

Should the patient survive the attack, and the case continue in subacute forms, treatment must be directed to nourishing the patient, to improvement of the general condition, and toward increasing muscular power in paralyzed parts. These indications are to be met by careful and systematic feeding of light and easily-digestible articles, by massage, faradization, and Swedish movements of affected members to prevent contractions.

Acute Suppurative Encephalitis.

Acute inflammation of the brain terminating in the formation of pus may be a focal or circumscribed process, in which single or multiple areas are affected; or it may be a diffuse process affecting large areas of the cortex, often with implication of the adjacent membranes, or larger or smaller areas of the brain-substance may be involved, often including the lining membrane of the ventricles. The majority of cases of abscess of the brain are inflammatory in origin, so that acute suppurative encephalitis in its circumscribed or focal form is practically synonymous with cerebral or encephalic abscess. Certain cases of abscess may occur without any evidence of an inflammatory genesis. They are, however, due to necrotic softening and do not come under consideration here, as they are considered under CEREBRAL ABSCESS. Practically, inflammation of the brain, in its suppurative form, occurs as a focal or diffuse

disease, and the former is *clinically* abscess of the brain, while the latter is most common as a diffuse meningo-encephalitis. These affections, although closely allied, for clearness of description will be considered separately.

(A) Acute Focal Suppurative Encephalitis.

Synonyms.—Abscess of the brain; encephalic abscess. (See CEREBRAL ABSCESS, volume ii.)

(B) Acute Diffuse Suppurative Encephalitis.

Definition.—Diffuse suppurative encephalitis, as the term implies, is a diffuse infective inflammation involving large areas of the brain, often with coincident involvement of its membranes, and resulting in pus-formation.

Symptoms.—The symptoms of this condition are those of cerebral irritation and compression of large and irregular areas of the brain. The signs present point to a septic process. The pulse, temperature, and respiration are irregularly affected; sudden variations in all three frequently occur. Chills or rigors may be a marked feature. The symptoms in addition which are present in whole or in part in such cases are dull and deep pain in the head, stupor with attacks of delirium, irregular local or general convulsions or paralysis, optic neuritis, various forms of aphasia, anæsthesias or paræsthesias of irregular distribution, oculomotor palsy, various disorders of vision, or of other special senses, according to the region of brain involved. The patient may die within a few days or a week, especially in cases due to severe head-wounds, fractures, or lacerations of the brain-substance. In such cases an extensive leptomeningitis is commonly present in addition. In other cases the acute symptoms pass away and leave the patient in a condition of great torpidity,

with pain in the head, spastic or chronic paralytic phenomena, occasional convulsions and progressive loss of function in those parts supplied by the affected part of the brain. In some cases patients may linger for months with hopeless mental deterioration, extensive motor and sensory paralysis, and partial or complete destruction of some of the special senses. Death in these cases finally results from exhaustion.

Etiology.—This form of suppurative encephalitis follows, at times, severe injuries, or it may be a complication or a sequence of one of the acute infectious diseases. It has the same general etiology as the focal form of suppurative encephalitis, already referred to. It is never primary.

Pathology.—Post-mortem examination reveals large areas of disorganized, pulpy, soft, or even semifluid consistence of the affected portion of the brain. The adjacent membranes are likely to be involved, and may be softened, deeply congested, and covered with purulent exudate, which may also fill up the sulci and large fissures of the organ. In cases running a subacute course, the membrane may be considerably thickened, with breaking down of their cerebral surfaces. Microscopically there is the pus-cell, massing of leucocytes around the borders of the process, dilated vessels and perivascular spaces, and within the area of utter destruction are seen compound granule-cells, granular *débris*, and the remnants of nerve-cells and fibres. Any of the pathogenic bacteria mentioned under acute focal suppurative encephalitis may be present. The bacillus communis coli has also been observed by Howard.

The infection followed a suppurating rectal wound, the child presenting very interesting congenital malformations of

the heart, with imperforate rectum. The post-mortem lesions in this case were acute purulent ependymitis and encephalitis (the ventricles being distended with pus), with basic and cortical meningitis. The pus was creamy, yellow green in color, and a micrococcus was present in it as well as the bacillus communis coli. Howard (Johns Hopkins Hosp. Bull., vol. iii, p. 59, '92).

In some of the cases running a chronic course the brain-destruction may be very great, and an entire hemisphere or even more of the brain be destroyed, and present at the autopsy a semifluid and purulent mass.

Diagnosis.—The diagnosis is made by a study of the cause producing the condition, the very grave nature and the decidedly septic character of the cerebral and general symptoms, the irregularity of its course, and the irregular and widespread impairment of motor, sensory, or special-sense functions, according to the region affected. When in conjunction with purulent meningitis, the condition affecting the brain-substance can only be suspected by the intensity of the symptoms present, and their mode of onset, the grave set of paralytic symptoms with mental confusion or deep stupor, often succeeding the most acute manifestations of the meningeal inflammation.

In some cases in which post-mortem examination reveals a large region of the brain converted into pus, and especially in those cases where the clinical history was one of gradual loss of motor or sensory functions, with loss of memory, confusion of mind, without any period of active inflammatory symptoms being traceable, the condition has been called "cold abscess of the brain." It is more probable that such cases should be placed in a distinct class and that the fact be recognized, as pointed out by Gowers

and others, that there is this form of softening which depends essentially upon a slow chronic form of encephalitis. These cases, however, are quite rare, and are more often encountered, probably in hospitals for the insane than in civil practice. It is apt to occur in advanced life, at least after the age of forty.

Prognosis.—The disease always terminates fatally, although some cases last several weeks.

Treatment.—Little need be said of treatment, which must usually be expectant and symptomatic. Cases presenting signs of superficial pus-conditions should have the benefit of trephining. Trephining with drainage of the ventricles may also be practiced in cases where the ventricles are distended with pus and signs of compression are great. Some cases of this kind have been reported, in which free collections of pus in the cerebral fissures have been evacuated and drained with success, so that in all cases in which a diagnosis can be made the operation should be performed.

Chronic Encephalitis.

The term "chronic encephalitis" has an indefinite and vague meaning, because it has been applied by different writers to a number of pathological states. As a clinical type, rare cases exist which present, post-mortem, a diffused general sclerosis of evident inflammatory causation. These cases are rare, and the symptoms observed during life are very variable and their significance is rarely apparent during life. Sclerosis is, according to some authorities, always primarily an inflammatory process. If this be assumed, then the pathology of almost all chronic brain diseases would have chronic encephalitis as their prime causative factor. Considerable doubt, however, exists as to the essential nature of ordinary cerebral

sclerosis, and positive proof is lacking. In gouty patients, according to Gowers, a chronic focal inflammation of the cortex may exist and simulate brain-tumor, and optic neuritis may be present in addition to focal symptoms. Hughlings-Jackson and others also have reported cases of seemingly primary chronic encephalitis; but the cases are too few to need a separate classification. In some of these cases hypertrophy of the cortex has been noticed.

Definition.—In the present state of our knowledge, chronic encephalitis may be defined as a term which is used to denote several pathological states, but is applied more especially to cases in which there is great increase in the connective-tissue elements, resulting usually in hardening of the brain, with secondary degenerative, nutritive, and functional changes in the nerve-elements, and may rarely produce a state of chronic softening.

Varieties.—The following types may be said to show greater or less degrees of chronic encephalitis.

(a) Terminal stages of cases arising more or less acutely, but resulting in chronic cerebral lesions.

In this class may be included those cases presenting residual symptoms, lesions of focal and diffuse non-suppurative encephalitis, the zones of dense connective tissue, proliferation surrounding old cases of embolism, thrombosis, abscess and tumor, the secondary reactive sclerosis found in cases of spastic paralysis, and the sclerotic patches of disseminated sclerosis, insular sclerosis, and the syphilitic forms of the same affecting the brain often in conjunction with a similar spinal lesion. All of these pathological states are essentially of the nature of a chronic inflammation, and in all of them the vascular connective-

tissue element predominates, to the impairment or destruction of the parenchymatous brain-tissue. The symptomatology of all of the above lesions, of course, differ widely according to the site of the lesions, but the chronic encephalitis undoubtedly is a factor in these and many more, which readily suggest themselves to the mind of the student of nervous diseases, in which the sole persistent lesion is a sclerosis which is of undoubted inflammatory origin.

(b) Chronic meningo-encephalitis. This is the distinctive lesion of paralytic dementia, and for our knowledge of its minute anatomy we are chiefly indebted to the studies of Bevan Lewis. The brain-cortex and the pia mater are involved in the process. It may also effect the brain to a considerable depth, varying in different convolutions, and ependymitis is frequently also present. Raymond considers the starting-point of the disease in syphilitic subjects to be in the walls of the capillary blood-vessels of the cortex. Bevan Lewis recognizes three stages to chronic meningo-encephalitis, which he gives as follows: 1. Stage of inflammatory proliferation in the tunica adventitia of the arterioles, with special nuclear proliferation, alterations in the calibre of the vessels, and secondary trophic changes in the surrounding tissue. 2. Stage of development of the lymph-connective system, with degeneration and loss of nerve-cells and fibres. 3. Stage of fibrillation of connective-tissue elements, with great atrophy of the affected portion of the brain.

On removing the calvarium, in these cases, it is noticed that the dura is generally more or less adherent, the cerebrospinal fluid is increased, the meshes of the pia mater are cedematous and fill up the solei all over the cortex, especially in the motor area and over the postero-

parietal region. The cortex and membranes are adherent; so that often the cortex is lacerated on removal of the membranes. Marked atrophy of the convolutions is nearly a constant feature. The cortex is harder than normal. On section the thickness of the cortex is diminished, and in places no clear demarkation exists between the gray and white matter. There is ventricular dilatation and granular ependymitis. All of these changes are especially marked over the frontal and parietal regions.

Pathological findings analogous to the above are also observed in some cases of chronic epilepsy, and in certain types of chronic dementia; but this pathological combination is so uniform and striking in paralytic dementia that it has been accepted unanimously as the lesion of that disease, and by some writers, including Osler, the term "chronic meningo-encephalitis" is used as synonymous with "general paralysis of the insane."

The symptoms, etiology, diagnosis, prognosis, and treatment of this condition need not be referred to here, since they will be found in the description of paralytic dementia, which is here only taken as the most prominent type of chronic meningo-encephalitis, but not as the sole condition in which this lesion exists.

(c) The consideration of forms of chronic softening due to chronic encephalitis need scarcely be mentioned, since the evidence upon which their pathology rests is too meagre. The existence of such cases has, however, been mentioned by Gowers and others, but the writer has been unable to find the accounts of any post-mortem examinations bearing upon the subject. The chronic state of diffuse or focal suppuration has been referred to as a sequel to an acute inflammation.

Symptoms.—The symptoms of chronic encephalitis will depend upon its variety, etiology, location, and the grade of the process, as will readily be appreciated when the wide range of clinical cases in which this lesion exists is considered. Reference has been made to the types described by Hughlings-Jackson and by Gowers, in which more or less severe signs of cerebral irritation existed for months, with slight fever, and sometimes spastic neuritis, especially in those cases having head-pain, vomiting, and focal signs simulating those of tumor.

In all cases in which chronic encephalitis exists as a complicating or reactive inflammatory condition, its symptomatology is essentially that of the primary condition giving rise to it. This refers to cases of brain-tumor, abscess, embolism, thrombosis, foreign bodies implanted in the brain, exostoses of the cranial bones inflicting pressure upon the brain, or calcareous growths developed within the cerebral membranes.

Chronic encephalitis enters also into the pathology of syphilis and of chronic alcoholism.

For the symptoms caused by chronic meningo-encephalitis—or “periencephalitis,” as preferred by certain writers—the reader is referred to the article upon paralytic dementia, or general paralysis of the insane; while essentially the same lesions occurring in some cases of chronic epilepsy and of terminal dementia do not give rise to any constant clinical type.

It is thus seen that the study of the clinical symptoms which may arise upon the pathological basis of chronic encephalitis are many and varied, and can only be studied as types, some of which have been indicated as most clearly proved to exist as results of an inflammatory lesion.

Etiology.—The primary etiological

factor in cases of chronic encephalitis is, excluding syphilitic cases, almost always obscure, and the exact nature of the primary irritant, which we must assume as causative, is still a subject for future investigation. There is, in certain cases, probably an hereditary predisposition or weakness of the cerebral vascular system, owing to which the changes in the perivascular connective tissue occur from causes insufficient to produce them in the ordinary brain. This hereditary factor in etiology is hard to prove, but is frequently suggested in the clinical study of the cases.

The obvious predisposing causes of chronic encephalitis are those common to very many diseases of the brain, and include syphilis, embolism, traumatism, excessive physical or mental labor, anxiety or worry, fright, the acute infectious diseases; organic affections of the kidneys, liver, or heart; and others.

There is little doubt that prolonged mental overwork, especially if associated with prolonged anxiety, is capable of leading to pronounced vascular disturbance in the cerebrum, thus furnishing the conditions upon which the inflammatory process may be readily ingrafted.

Pathology.—So far as is known, the primary changes in chronic encephalitis occur in the vascular (mesodermic) connective tissues, and other structures are coincidentally—or, more usually, *subsequently*—attacked. In syphilitic cases the specific irritant toxin probably acts upon the nerve-cell, the neuroglia, the lymph-connective system, and the vascular and perivascular tissues; and it is further probable that one or other of these elements suffer more or less in different cases, and that this explains in some degree the wide range of syphilitic brain-symptoms. It would appear, however, that chronic encephalitis from all

causes is usually of primary vascular origin, the pathological and clinical evidences both supporting this view.

Post-mortem examination in cases of chronic encephalitis reveals most commonly atrophy of the affected part, with hardening of the tissues; very rarely it has revealed hypertrophy of the convolutions as a result of the inflammation; according to the observations of Gowers, a type of chronic encephalitis exists in which no macroscopical change can be noticed after death, but in which "slight diffuse inflammatory changes were found throughout the brain-substance on microscopical examination." In certain other cases the same authority affirms that chronic encephalitis may cause a form of chronic softening, which has already been referred to in this paper.

The microscopical appearances differ according to the stage of the process, and have already been sufficiently referred to in describing the varieties of the disease.

The real significance of all of these chronic changes remains the subject of dispute, and able authorities on either side contend, on the one hand, for the inflammatory origin of the lesions described, while, on the other, degeneration is held to be the first step in the process. It seems, however, to the writer that the term "chronic encephalitis," according to our present knowledge, should include the clinical states to which reference has briefly been made, and that the theories of agenesis and degeneration are very satisfactory as applied to a great number of other chronic brain conditions, which present analogous lesions, but in which no inflammatory stage is known to exist. Continued and careful clinical and pathological evidence is needed to limit strictly the meaning of chronic encephalitis, or positively to ex-

tend it so as to exclude more of these sclerotic lesions than at present we are justified in applying to it.

Diagnosis.—The diagnosis of chronic encephalitis is made from the presence of one or other of its causes and the association of its symptoms. According to Gowers, in rare cases of chronic encephalitis, chronic headache with long-continued cerebral symptoms, including optic neuritis, may simulate tumor of the brain. Hughlings-Jackson has reported a case in which such symptoms existed for six months. These symptoms in these rare cases of primary chronic encephalitis may be headache, vertigo, epileptic attacks, transient loss of sight or other special senses, vomiting, optic neuritis, slight fever and stupor, followed by coma and death. The diagnosis from tumor would be made by noting the want of progressive nature of the lesion, commonly present in tumor, the general character of the head-pain, and other symptoms of cerebral irritation, and the more definite focal symptoms of tumor would also be wanting.

The forms of chronic encephalitis surrounding new growths or other focal lesions need not be discussed, because their diagnosis is that of the primary condition practically.

Chronic meningo-encephalitis does not present any very distinct clinical type, except when present as the lesion of paralytic dementia.

Prognosis.—In all forms of chronic encephalitis the prognosis is very grave; in most cases absolutely hopeless as regards cure. All cases of paralytic dementia end fatally, except in extremely rare instances, in which a remission lasting many years may occur. The acute forms of chronic encephalitis which have been mentioned may run prolonged courses, and death may result from in-

tercurrent disease, but is more usually due to the brain condition directly or indirectly.

Treatment.—The most hopeful cases of chronic encephalitis clinically are those resulting from syphilis. In such cases large doses of the iodide of potassium combined with rest and general tonic treatment sometimes accomplishes extremely satisfactory results. The rare cases in which chronic encephalitis is suspected as a primary condition must be treated on the general principles governing the treatment of chronic inflammation. The cases associated with other focal cerebral lesions require the treatment necessary to the primary condition present.

Prenatal Encephalitis.

The basis for belief in a prenatal form of encephalitis is chiefly the studies of Virchow, who described in 1865 whitish or yellowish-gray foci in the brain of newborn infants which he considered inflammatory in origin. These foci he describes as a fatty change in the neuroglial cells, with unequally-dilated and obstructed vessels and neuroglial cell-proliferation along the vessels. He also refers to a peculiar kind of softening in connection with these foci. When the foci are situated in the white substance of the brain they are grayish-red in color, from congestion of the capillaries. Unless the lesions have progressed to the stage of softening the brain-consistence is unaltered. Hayem, on the contrary, regards fatty degeneration of the neuroglial cells as inflammatory only when associated with extreme congestion and the compound granular cell. Jastrowitz considers the condition physiological in foetal life, basing his conclusions upon a study of sixty-five cases. According to him, this fatty degeneration of the neuroglial cells does not fol-

low inflammatory proliferation as proclaimed by Virchow, but is commonly found in certain portions of the brain, increases until the seventh month of intra-uterine life, and disappears soon after birth. Virchow's observations have been confirmed by Parrot and others, but a great difference of opinion exists regarding the primary cause of these patches. Recent studies have demonstrated a form of miliary encephalitis in the newborn which is due to septic metastasis from suppuration of the umbilical cord, and other cases are reported in which this lesion has followed diphtheria and aphthous stomatitis, some authorities regarding this form of encephalitis as the primary stage of the lesions found in a proportion of the cases of spastic hemiplegia and diplegia, and in some cases of disseminated sclerosis in children.

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ENCEPHALOCELE.—Gr., *εγκέφαλος*, the brain, and *κῆλη*, a tumor.

Definition and Varieties.—*Encephalocele*, or *hernia cerebri*, means a protrusion of a portion of brain-substance with its membranes through an aperture in the skull, congenital in origin, and usually situated in the occipital region in the median line, less frequently in the nasofrontal region, and rarely in other situations. *Meningocele* and *hydrencephalocele* are closely allied conditions. *Meningocele* means a protrusion of a portion of the membranes of the brain through an opening in the skull, the sac thus formed being distended by cerebrospinal fluid. *Hydrencephalocele* means a protrusion of the membranes and brain-substance, which also contains within it a cavity continuous with the lateral ventricles of the brain, and filled with cere-

bro-spinal fluid. The latter condition is the gravest and the most frequent in occurrence of the three, encephalocele being next in frequency, and meningocele the rarest. All of these conditions are of very rare occurrence. Forms of acquired hernia cerebri will more properly be considered elsewhere, in connection with the various causes of this condition.

Symptoms.—In the three forms enumerated the disease is congenital, and is developed at some period of intra-uterine life; and at birth presents a tumor of varying size, generally situated in the occipital region, or in the naso-frontal region in the median line. In almost all cases the hernia emerges through an opening in the line of one of the cranial sutures.

The naso-frontal hernias leave the cranium between the frontal and nasal bones and form a tumor in the median line in the region of the glabella.

The naso-ethmoidal hernias leave the cranium between the frontal and nasal bones on the one side and the lateral mass or labyrinth on the other, which is forced or displaced downward toward the nasal cavity. The tumor appears externally in the region of the border between the osseous and cartilaginous portions of the nose, hanging down toward the tip or the wing of the nose.

The naso-orbital hernias leave the cranium between the frontal, ethmoid, and lacrymal bones. In the region of the latter they enter the orbit and present at or near the inner canthus of the eye. The naso-ethmoidal and naso-orbital varieties are probably not distinguishable from each other, as they leave the cranium at the same place, namely: the nasal notch of the frontal and the cribiform plate of the ethmoid bone. Christian Fenger (*Amer. Jour. Med. Sci.*, Jan., '95).

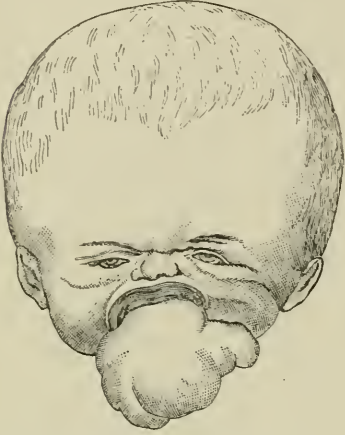
Of 93 cases collected by Houel, 68 cases were occipital, 16 were fronto-nasal, and 9 occurred in other situations; while

of 105 cases collected by Schatz, 59 were occipital and 46 frontal. These hernial protrusions may occur in other situations. Thus, in the frontal region instead of emerging between the cribiform plate of the ethmoid and the frontal bone, such a protrusion is sometimes located in the interfrontal fissure high up, or in the anterior fontanelle; less frequently they occur in the sagittal suture, or between the temporal and parietal bones, thus appearing upon the side of the head. The frontal tumors are smaller, as a rule, than the occipital growths, and are covered with a more vascular skin covering; so that they may give the appearance of certain forms of *nævus*. In extremely rare cases the opening has existed between the sphenoid and ethmoid bones, or between the sphenoid and its greater wing.

Specimen of *hydrencephalocele palatina* in a newborn child. From the mouth protruded an irregular nodulated tumor the size of a small apple. It was apparently adherent to the hard palate, but upon section it was seen that it had pushed both the vomer and the hard palate forward and upward, and that it emerged from the cranial cavity through a broad opening immediately anterior to the sphenoid bone, and behind the still cartilaginous ethmoid. The anterior portion of the sphenoid was forced downward and backward, and the connection between it and the vomer interrupted by the tumor; so that the vomer was connected only with the ethmoid. The anterior portion of the sac contained a cavity lined with smooth *dura mater*, below and behind which were several irregular smaller cavities. In the upper portion of the tumor was brain-substance, which extended from this point up into the cerebral portion of the cranial cavity. The brain was pushed downward toward the base of the cranial cavity, and above it was a large cavity filled with fluid and surrounded by a thick membrane. R. Virchow (*Die Krankhaften Geschwülste*, B. 1, p. 188, '63).

The tumor may thus appear in the pharynx, or in the mouth, or protrude through the spheno-maxillary fissure, or into the orbit, causing displacement of the eye.

The physical characteristics of the three forms of congenital tumor differ



Palatine hydrancephalocele in a newborn child. (*Virchow.*)

according to the size of the opening in the skull and the nature of their contents. Owing to possible error in diagnosis, all tumors of this kind should receive most careful physical examination, especially if any surgical interference should be contemplated.

(a) Encephalocele presents the smallest tumor of the three, usually rounded or oval with a broad base, and having a pretty firm resistance to the touch. Sometimes the tumor is marked by a median furrow, dividing it into two lateral halves. The tumor is opaque, does not fluctuate, has distinct pulsation synchronous with the heart's action, and pressure upon it causes symptoms of cerebral compression, such as nausea, vomiting, irregular respiration, strabismus, and even convulsions.

(b) Meningocele appears as a more uniformly round or oval pedunculated tumor, usually small at birth and subsequently increasing more or less in size. It is translucent, fluctuates distinctly, does not pulsate, is made intense on the crying of the child, or during forced expiratory efforts, and it is reducible upon pressure.

(c) Hydrancephalocele presents the largest tumor of the three forms of this condition. The tumor is lobulated, pendulous, and more or less pedunculated; and there is fluctuation, translucency of parts of the tumor, according to the amount and location of the liquid contained within it, and usually absence of pulsation. The surface of the mass is covered with hair if the tumor is small, but if large the hair is only about its base, being absent over its fundus. It is liable to increase of size and to final rupture with rapid collapse or convulsions prior to death. Pressure does not pro-



Encephalocele. (*Holt, "Diseases of Infancy and Childhood."*)

duce the marked signs of cerebral compression observed in cases of encephalocele. In some cases some form of paralysis may also be present, with microcephalus and hydrocephalus.

Differential Diagnosis.—Any of these conditions may possibly be confounded

with cephalhæmatoma, serous or sebaceous cysts, abscesses, nævi, and polypi. Such mistakes having been made, it is most important that the most careful examination should precede any surgical

ure is made upon the tumor, and pulsates distinctly, and that all of them are made tense upon forced expiration, should separate them from any of the above conditions. In many of the cases the edges of the bony opening through which the protrusion occurs can be felt by palpation, with partial reduction by



Naso-frontal meningocele. (Holt, "*Diseases of Infancy and Childhood.*")

interference; but, with ordinary care and attention to the physical characteristics of these forms of hernia cerebri, mistakes of this kind should never occur. The diagnosis, therefore, is usually a simple matter, and is readily made upon careful



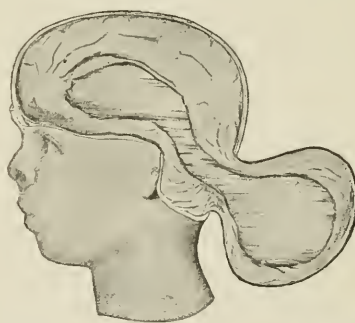
Diagram of meningocele. (Holt, "*Diseases of Infancy and Childhood.*")

pressure. Hydrencephalocoele can hardly be confounded with any of the above affections, owing to its large size, its pendulous, pedunculated, and lobulated conformation, with semitranslucency, and its strictly congenital history. All



Occipital meningocele. (Holt, "*Diseases of Infancy and Childhood.*")

examination of the tumor. The fact that these conditions usually occur in the median line, that meningocele is reducible, that encephalocoele is attended by signs of cerebral compression when press-



Hydrencephalocoele. (Holt, "*Diseases of Infancy and Childhood.*")

of these cases are apt to be associated with other deformities, and some form of paralysis is frequently present in cases of hydrencephalocoele.

Etiology and Pathology.—The exciting causes of these three forms of congenital malformations are practically unknown. It is probable that injury to the mother may account for some of the cases. The influence of certain maternal impressions may operate here, by inducing an arrest of development.

The most widely accepted view of the pathology of these states is that they are all due to a primary intra-uterine hydrocephalus, and that the resultant increased intracranial pressure during the closure of the cranial cavity causes a portion of the intracranial contents to be forced outside, an aperture being maintained. Other possible causes are amniotic adhesions to the scalp of the fœtus, and arrest of development in the bones concerned. This arrest of bony development may be caused by amniotic adhesions. However, the fact that these protrusions occur in the median line favors hydrocephalus as the causative condition.

Prognosis.—The prognosis is unfavorable, except in cases of small meningocele amenable to operation, and in cases of small encephalocele, some of which live for many years. Hydrencephalocele is usually a fatal condition, death occurring in from a day or two to several weeks.

Treatment.—Meningocele has been frequently aspirated, and the injection of iodine into the sac in the form of Morton's solution has been practiced. Many forms of operation have been tried in these cases, and successful operations have been reported from all of them, but, even in the successful cases, chronic hydrocephalus has often followed.

Attempts at the removal of encephalocele by operation have been made by Lichtenberg, Czerny, and the author. Lichtenberg's patient died from the operation; Czerny's patient survived the

operation, but died later from apparently independent causes.

Personal case in which the patient made a permanent recovery: that of a Swede, in whom was found a tumor filling the post-nasal space above the soft palate. On palpation the tumor seemed somewhat compressible and would, upon pressure, appear to decrease in size so that it could be pushed up into the left half of the posterior nares. The pedicle could be traced to the roof of the nose. Cerebral hernia suspected. Hypodermic needle twice inserted with negative results and diagnosis of ordinary polypus and not basal hernia made. An attempt made to remove the growth in the usual way with the wire snare and the pedicle divided. After withdrawal of the snare slight hæmorrhage occurred, but neither coughing nor sneezing brought forth the tumor. The hæmorrhage soon ceased, but was immediately followed by dripping of a clear watery fluid, of which about a teaspoonful was collected. The fluid was cerebro-spinal. The basis of the plan of operation now was to secure the pedicle for transfixion and ligature as close to its exit from the cranium as possible. The operation of the osteoplastic or temporary resection of the superior maxilla as devised by von Langenbeck was accordingly executed. Ten weeks after the operation the wound was so nearly closed that collodion dressing could be applied over the fistula leading into the antrum, which remained open for about three months, but secreted little and did not interfere with the patient's work as coachman.

The microscopical examination showed distinctly that the tumor was a cysto-encephalocele. Although no layer of white brain-substance was present, there was no doubt that this cavity was a continuation of a ventricle, probably the third ventricle. Its regular shape, and the fact of its being entirely surrounded by a layer of cortical brain-substance, made it distinctly different from the serous cavities which are found in hernias of the brain as well as of the spinal cord, developed from, or an exaggeration of, the subarachnoid lymph-spaces.

The distance between the eyes a point in diagnosis. It is possible that a basal cerebral hernia might cause a broadening of the root of the nose and a corresponding increase in the distance between the inner walls of the orbits, just as occurs in sincipital hernias. Christian Fenger (Amer. Jour. Med. Sci., Jan., '95).

Treves operates in these cases only when rupture is threatened. Schatz (Berlin klin. Woch., No. 28, '85) gives statistics as follows: 3 recoveries in 24 occipital tumors not operated on, and 6 recoveries from 35 operated on by injection, clamp or ligature, or excision. Six recovered out of 46 frontal tumors without operation, while 2 recovered out of 14 operated on. The tendency at present is to operate upon these cases, although the results are not very encouraging.

When the tumor is not small, it should be supported by gentle pressure,—or a collodion dressing may be applied over it, as advised by some surgeons.

In the case of a small encephalocele it is better to apply gentle pressure, and to wait in order to find out if it inclines to enlarge. In this form the patient may live many years and experience no discomfort from the condition.

Cases of spontaneous cure of encephalocele and meningocele have been reported. This is effected by gradual growth of bone around the opening, with retraction of the sac. The opening in some cases becomes entirely closed. This is, however, of very infrequent occurrence.

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ENCHONDROMA. See TUMORS.

ENDOCARDITIS. See VASCULAR DISEASES.

ENDOMETRITIS.—Gr., *ἐνδον*, within, and *μήτρα*, the uterus.

Definition.—An inflammation or hyperplasia of the uterine mucous membrane involving, to a greater or less extent, the parenchyma of the uterus.

Varieties.—It is convenient, both in a clinical and a pathologic sense, to divide the disease into two varieties, viz.: (1) interstitial or functional endometritis; and (2) glandular or functional endometritis, or hyperplasia. Either of these two varieties may exist in the acute and chronic form, but the chronic form may follow a mild and overlooked acute attack, or may supervene in a gradual manner without being preceded by a recognizable acute attack.

There are three varieties of endometritis: the glandular, interstitial, and fungous. The form described as endometritis decidua is a combination of the glandular and interstitial forms, while gonorrhœal endometritis is of the interstitial variety and similar to senile endometritis. Winckel (Münch. med. Woch., July 31, '94).

Literature of '96-'97-'98.

Endometritis is exceedingly rare; only about one case in fifty that come to the clinics is really endometritis. H. A. Kelly (Med. Rec., May 21, '98).

Symptoms.—The symptoms may be divided into (1) disturbances of the sexual functions, (2) intermenstrual discharges, (3) pain and discomfort in and about the uterus or radiating from the uterus, (4) reflex disturbances, and (5) general symptoms.

Menorrhagia is one of the most frequent symptoms in the early stages and in the *glandular* variety it often persists for a long time as the most prominent one. The flow may be moderately increased in amount, or be a profuse hæmorrhage with the passage of clots; it may be prolonged, or may recur too often. In the

later stages of *septic* or *interstitial* endometritis the menses are sometimes scanty. In certain acute attacks the menstrual flow is suppressed.

Dysmenorrhœa is common in cases connected with flexion, puerile cervix, or inflammation of the appendages.

Literature of '96-'97-'98.

Dysmenorrhœa and menorrhagia from which many young girls suffer are due to endometritis, and the chief causes leading to this condition are tight corsets, exposure of the feet to wet and cold, chronic constipation. A. Laphorn Smith (Amer. Medico-Surg. Bull., May 30, '96).

Dyspareunia and sterility may be present under the same conditions.

Sterility in woman is most frequently due to catarrhal endometritis, resulting from a previous miscarriage. The principal causes are: the absence of a suitable habitat for the ovum in the uterine cavity; obstruction of the cervical canal by mucus; and increased alkalinity of the cervical secretions, corresponding to an exaggerated alkaline condition of the vaginal mucus. W. P. Manton (Amer. Jour. of Obst., No. 4, '92).

Literature of '96-'97-'98.

Case of gonorrhœal endometritis causing premature separation of the placenta. Maslowsky (Monats. f. Geburts. und Gynäk., B. 4, H. 3, '96).

Leucorrhœa is usually noticeable in the glandular variety and in the early stages of the septic. In the former the corpus secretes a thin, and the cervix a thick, clear mucus, both of which may be transformed into minute white coagula, at the external os, by the acid vaginal secretion, and appear at the vulva as a white or greenish-white discharge. In some cases the mucus is intermittingly tinged with blood. The leucorrhœa may last throughout the month, or only for a few days after the

cessation of the monthly flow. In the septic variety the discharge is at first purulent, but later becomes muco-purulent, and in time may be mucous or even watery in character. It sometimes has a disagreeable odor.

Pain may be felt in the sacral or lumbar region, and may extend across the back or up the spine to the occipital region, or down the course of the sciatic nerve. Cutting or cramping pains across the lower abdomen or pubic region may be complained of, depending upon painful uterine contractions due to the expulsion or attempted expulsion of uterine discharges. Irritability of the bladder or rectum, or pain in the vagina or pubic bones, may be prominent. Feelings of weight in the vagina, and sensations as of prolapse of the pelvic organs are present in some cases. Intercostal neuralgia is not uncommon.

Menstrual pain of a burning or aching character may be felt in the pelvis and back, or the pain may be suprapubic and colicky. It may last one or more days or throughout the period, and even for several days afterward. When the mucous membrane is exfoliated the uterine contractions are frequent and excessively painful, and last until the membrane is expelled.

Gaseous distension of the intestines, constipation, impaired digestion—with its accompanying reflexes, photophobia, and pain in the eyes after prolonged attempts at reading—are the ordinary reflex disturbances. Mental depression, worry, and the various manifestations of hysteria and neurasthenia are sometimes classed among the reflexes, although they are, as a rule, largely dependent upon other conditions and circumstances.

Chills, fever, and the other general symptoms of inflammation and sepsis are observed in acute endometritis.

In chronic cases anæmia and nervous debility are often present.

Diagnosis.—Endometritis must be differentiated from angioma, tuberculosis, carcinoma, and myoma of the uterine mucous membrane.

Besides the symptoms, tenderness of the uterus, as evidenced by bimanual palpation, and sensitiveness of the endometrium at the internal os and fundus, as demonstrated by the passage of the sound, are of diagnostic value. The withdrawal of the sound may be followed by a moderate flow of blood or mucus.

Differential diagnosis between catarrh limited to the cervix and cervico-corporeal catarrh: (1) thin, purulent discharge indicates catarrh of corporeal endometrium; (2) cervical catarrhs seldom occur in multiparæ; (3) reflex symptoms point to trouble of mucosa; (4) cervical catarrhs are rare in virgins, cervical and corporeal catarrh still more so. Van Tussenbroek and de Leon (*Archiv f. Gynäk.*, B. 47, '94).

Two cases of syphilitic endometritis observed, the disease affecting the placental site after abortions and manifesting itself by profuse hæmorrhages and a continued proliferation of granular tissue. This returned so quickly after repeated thorough curettings and cauterizations that it resembled a malignant growth. Ashby (*Obstetric Gaz.*, Feb., '88).

Endoscopy recommended in the study of endo-uterine affections; the technique is not difficult. Bumm (*La Semaine Méd.*, June 15, '95).

[It is certainly doubtful whether the examination of the uterus by the endoscope affords information that justifies the danger of carrying infection to the uterine cavity. E. E. MONTGOMERY, *Assoc. Ed.*, Annual, '96.]

It is difficult to distinguish ANGIOMA from hæmorrhagic glandular endometritis except by the aid of the curette, which, in the latter case, will bring out some of the hyperplastic mucous membrane.

In TUBERCULOSIS of the endometrium the curette will find necrotic, cheesy particles and perhaps tuberculous tissue. An accompanying bilateral salpingitis and pelvic peritonitis with encysted ascites, particularly in virgins, indicate the condition. Tuberculosis elsewhere, and a slowly progressive anæmia, add probability.

In CARCINOMA and SARCOMA watery discharges, fœtor, gradually-increasing metrorrhagia, rapid progress and the microscopical examination of the findings of the curette are diagnostic. Carcinomatous infiltration of the cervix produces a globular enlargement that affects the supravaginal portion as much or more than the vaginal. Carcinomatous ulceration is excavated, fissured, pale red or grayish, with vascular spots that are friable and bleed easily upon being touched. A tenaculum tears it easily and causes abundant hæmorrhage, but will hold firmly in an inflamed cervix. When there is cystic degeneration the tenaculum may tear out easily, but it causes a flow of mucus from the lacerated follicles with or without some hæmorrhage. The inflamed cervix is usually soft and elastic, the carcinomatous either hard or friable.

Small intra-uterine and submucous MYOMATA usually cause marked enlargement of the uterine cavity, and can sometimes be felt by the sound. Digital examination of the endometrium through the dilated and incised cervix is of great value in discovering this, as also of other conditions, although the procedure is a mutilating one and only advisable in rare instances.

Etiology.—*Acute* endometritis may result from trauma or taking cold during the menstrual congestion, such as suppression of menstruation from exposure to cold, excessive coitus, overexertion, or blows upon the lower abdomen during

menstruation. It may also be caused by infection, such as inoculation by gonorrhœal pus during or following coitus, infection of retained secundines, or the extension of sepsis from vaginal inflammation.

All forms of endometritis are infectious and take their origin from a point of infection from some pathogenic organism introduced into the vagina or uterus. Verchère (*La France Méd.*, Mar. 31, '88).

In the great majority of cases of endometritis micro-organisms are to be found in the cervical canal. In acute puerperal endometritis pyogenic microbes are present. In chronic cervical endometritis the micro-organisms are usually inoffensive. Solwjeoff (*Annales de Gynéc. et d'Obstet.*, Feb., '90).

Bacteriological examination of the endometrium in twenty-five cases of endometritis made and fourteen distinct species of micro-organisms were found. Brandt (*Med. Chronicle*, Apr., '92).

In three cases of endometritis during pregnancy, numerous cellular diplococci closely resembling gonococci found in the true decidua in the first, and in the serotina in the second. These micro-organisms did not stain by Gram's method. The subject of the first observation again suffered during a subsequent pregnancy from endometritis, and aborted at the fourth month. The true decidua were greatly altered, thickened, and were strewn with small round cells, particularly abundant on the surface. In these cellular foci long filaments made up of short bacilli, staining by Gram and Weigert's method and growing on agar-agar, were found. This bacillus had many of the characteristics of the bacillus coli communis, but differed in its reaction to Gram's method. Emmanuel (*University Med. Mag.*, Aug., '95).

Simple uterine catarrh usually results from distinct venous congestion. It frequently arises from this cause during infancy from improper clothing, especially tight bandaging of the body. Catarrh may also arise in childhood from want of cleanliness, irritation of the vulva, and entrance of worms into the vagina. Anæmia and other diseases of

the blood also cause it in childhood. Winckel (*Wiener med. Woch.*, No. 27, '95).

The pyogenic form is most common in puerperæ. The streptococcus pyogenes is nearly always the active agent, though staphylococci, gonococci, and the bacterium coli commune may be etiological factors. Döderlein (*Centralb. f. Gynäk.*, No. 26, '95).

Literature of '96-'97-'98.

Endometritis is the result of infection with pathogenic micro-organisms which are carried into the uterus during the puerperal state, by means of examinations with unclean instruments; by means of sterilized instruments used in the vagina which has not been disinfected; by the gonococcus in about 35 per cent. of the cases, and by the bacillus of tuberculosis in 12 per cent. Every case should be submitted to radical treatment by means of the sharp curette and drainage with iodoform gauze. J. T. Jelks (*Inter. Jour. of Surg.*, Feb., '96).

The hitherto general belief that inflammations of the uterus are divided into metritis and endometritis can no longer be considered correct, since it has been shown that the uterus is always diseased *in toto*. The causes of metro-endometritis are such uterine inflammations as are caused by the introduction of micro-organisms, therefore infectious, and those in which there is no bacterial influence. Döderlein (*Centralb. f. Gynäk.*, No. 45, '96).

One hundred and seventy-nine cases of puerperal endometritis studied and placed in three principal groups:—

1. Pyogenic form due to streptococcus pyogenes (74 cases); the pyogenic form due to staphylococcus pyogenes aureus (4 cases).

2. Gonorrhœal form (50 cases).

3. "Putrid" form due to saprogenic bacteria (50 cases).

Six fatal cases recorded, and in all the infection was due to streptococci. In some of the cases the infection appeared to be of a mixed form. Krönig (*l'Obstétrique*, Jan., '97).

Endometritis may also follow traumatism with immediate or subsequent infection, such as lacerations of the cervix during labor or by instrumental dilation, curettage of the endometrium, the introduction into the uterus of strong irritants, the use of intra-uterine stem pessaries or poorly-fitting vaginal pessaries, irritating and unclean tampons, etc.

Experiments demonstrating the bactericidal property of vaginal secretion. With the exception of the gonococcus, bacteria cannot vegetate for any considerable length of time in the uterine canal. Menge (*Deutsche med. Woch.*, Nos. 46 and 48, '94).

If nothing is introduced into the normal human vagina for two or three days, it undergoes spontaneous sterilization of all germs except the vaginal bacillus of Döderlein. Krönig (*Deut. med. Woch.*, No. 43, '94).

In twenty-nine cases of endometritis of body no trace of bacteria found by microscopical examination or cultivation. Disease of mucous membrane not therefore kept up by bacteria in this region. This does not exclude the fact that disease of the mucous membrane arises from acute septic or gonorrhœal infection. Bumm (*Centralb. f. Gynäk.*, No. 26, '95).

Literature of '96-'97-'98.

Secretion obtained from the cavity of the uterus of 60 cases and examined microscopically and by cultures with the following results: In 21 patients, mostly cases of fungoid endometritis, no bacteria were found, and in most of the cases repeated examinations gave negative results. Seven of the 21 cases showed the presence of bacteria of some kind after frequent intra-uterine manipulation, probably due to inoculation by the instruments. The bacteria, however, were not pathogenic. The 39 remaining cases in which bacteria were found may be divided into two groups: those in which staphylococci were found and those in which non-pathogenic bacteria were present. Streptococci were absent in all cases examined. S. Gottschalk and Rob-

ert Immerwater (*Archiv f. Gyn.*, No. 3, p. 406, '96).

Traumatism or reinfection may convert a chronic into an acute endometritis. Poisons, such as phosphorus and the essential oils, are occasional causes.

Glandular endometritis may be caused by interference with the menstrual function by taking cold, overexertion, coitus, laborious or sedentary occupations, uterine displacements, obstinate constipation, etc. The same causes may act during puerperal involution or after abortion.

There is no specific organism for endometritis of pregnancy, which is always secondary and always in existence before the pregnancy. The glandular form of endometritis is an hyperplasia of the mucosa, of which the causes act indirectly upon the endometrium, such as onanism, sexual excesses, psychical influences, diseases of the ovaries, etc. The interstitial form is the result of infection or direct interference with the endometrium. The glandular form is more frequently the cause of sterility than the interstitial variety. Veit (*Zeit. f. Geburts. und Gynäk.*, B. 32).

Excessive coitus, masturbation, ovariitis, uterine fibroids, inflammation in neighboring pelvic organs, and interference with uterine drainage by stenosis may lead to it.

Gonorrhœa of the uterus produces in all cases an inflammation of the mucous membrane, designated as an interstitial endometritis with suppurative catarrh, and in a not inconsiderable number of cases the chronic course leads to increase in the number of glands. Wertheim (*Centralb. f. Gynäk.*, No. 26, '95).

Mycosis of the cervical canal is probably a more frequent cause of obstinate catarrh than is generally supposed. Calpe (*Centralb. f. Gynäk.*, No. 27, '95).

Literature of '96-'97-'98.

Endometritis fungosa may sometimes be found in virgins. The first characteristic symptoms appear with the first

menstruation. Infection with micro-organisms, masturbation, and traumatism are etiological factors. Latour (*Revue Inter. de Méd. et Chir. Prat.*, No. 18, '96).

Number of cases observed in which there was chronic catarrhal inflammation of the virgin uterus, and such marked eversion of the cervical lips as to give the appearance of an ordinary puerperal laceration of the cervix. In most instances the excision of the hypertrophic mucous membrane and curetting of the endometrium will effect a cure. P. F. Mundé (*Amer. Medico-Surg. Bull.*, May 30, '96).

Underlying a virginal or senile endometritis there is frequently a condition of malnutrition, spoken of in a general way as "lithæmia." Matthew D. Mann (*Amer. Medico-Surg. Bull.*, May 30, '96).

Chronic septic inflammation may result from one or more acute attacks or from infection by objects introduced into the vagina or uterine cavity whether by operation, examination, or improper attempts at medication.

Some cases of fœtid endometritis in aged women may be due to recurrence of simple endometritis of earlier life, or may be looked upon as the result of a necrotic process accompanying the elimination of fibromyomata from the uterus. It appears from five to fourteen years after the menopause, and attacks women who have borne children rather than nulliparæ. Maurange (*La Presse Méd.*, Jan. 26, '95).

Literature of '96-'97-'98.

Case of endometritis in a person who was undoubtedly a virgin and who had not been subjected to previous local instrumentation never seen. Howard A. Kelly (*Amer. Medico-Surg. Bull.*, May 30, '96).

Bacterial infection is by no means necessary for the production of many cases of chronic endometritis, although this condition may be the result of invasion by organisms, especially those of sepsis and gonorrhœa. Warbasse (*Amer. Jour. Med. Sci.*, Feb., '98).

Pathology.—The mucous membrane of the cervical cavity presents the same changes as those of other mucous membranes.

Cervical endometritis exhibits anomalies of secretion with reddening and swelling of mucosa. Gradual narrowing of os; retention of secretion; contraction. In consequence of retention, atrophy of mucous membrane. Ruge (*Centralb. f. Gynäk.*, No. 26, '95).

The alkaline mucous discharge that hangs from the cervix, together with the congestion and infiltration, often produces an exfoliation of the squamous epithelium of the vaginal portion, with reproduction in the form of cylindrical epithelium. This condition is called *simple erosion*. The infiltration and swelling of the submucous tissues causes more or less of a rolling out, or eversion, of the mucous membrane of the cervical cavity, which is more pronounced on a lacerated cervix. More or less folding of the mucous membrane may give the appearance of a papillary or granular surface, which is called *papillary erosion*. Pockets may form in these folds and, together with the everted cervical glands, may become occluded, giving rise to a cystic condition called *follicular erosion*. These follicles may become so numerous, or one or two may become so large, that the normal cervical tissue is either displaced or replaced by them, and *cystic degeneration* thus results. Sometimes localized hyperplasias are present, with projection of glandular polypoid masses. (See *Colored Plate*.)

The uterine mucous membrane above the internal os has somewhat different characteristics from those of other mucous membranes which have different functions. Its glands are simple depressions or epithelial tubules that extend to the muscular walls underneath. Instead of being imbedded in firm connective tis-

Fig.

Fig.3

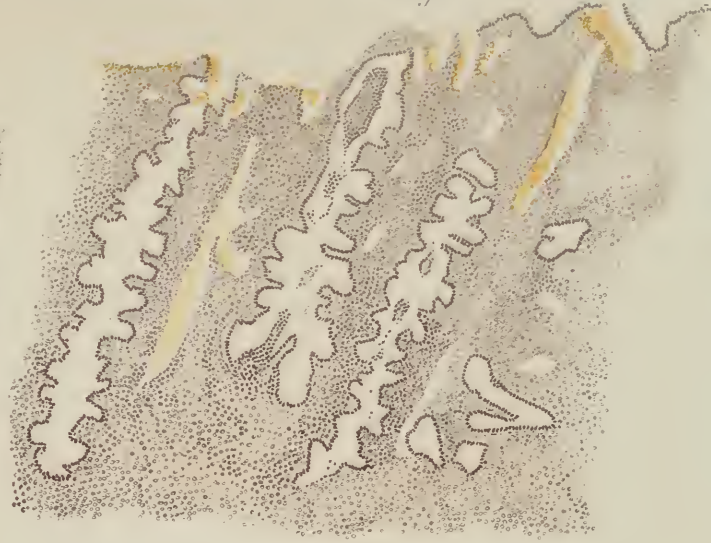
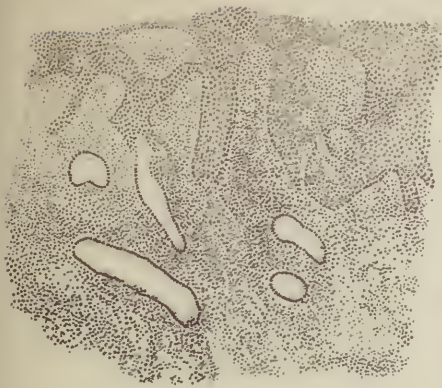


Fig.1

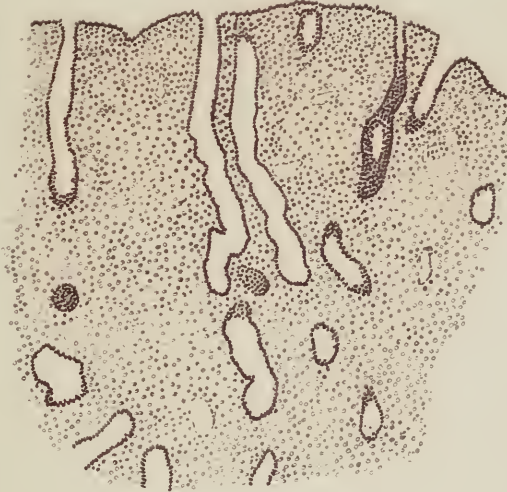
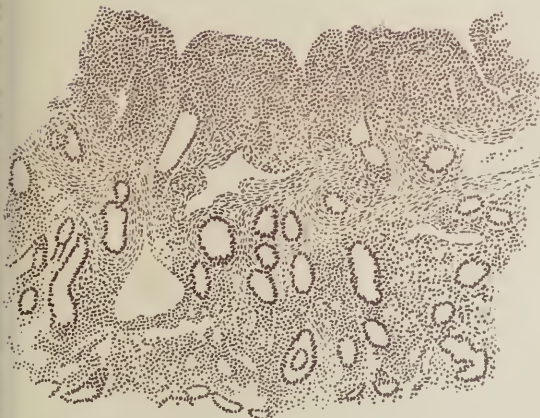


Fig.4

Fig.5



Comparative Histology of Endometritis (Zweifel)

Fig1. Normal Mucous Membrane Fig 2. Beginning Erosion of Cervix. Fig3 Glandular Endometritis
Fig 4. Acute and Chronic Interstitial Endometritis Fig 5. Chronic Interstitial Endometritis.

sue as are the cervical glands, they are surrounded at their inferior extremities by muscular fibres projecting from the muscular walls, which constitute an ill-defined muscular structure called the *muscularis mucosæ*. In the interglandular or intertubular spaces or fluid are found delicate connective-tissue fibers and round or oblong cells resembling lymph-cells.

When subjected to intense prolonged congestion an infiltration of serum takes place, raising the epithelial surface and causing a proliferation of the epithelial cells, with enlargement, as well as wrinkling, twisting, or bending of the glandular tubules; or in severe cases a formation of new depressions or tubules, some of which may become closed by bending or swelling at their orifices.

Literature of '96-'97-'98.

It is not uncommon to have variations in the number, shape, and size of the uterine glands, and it is not right to call this endometritis even if it is clinically so. William H. Welch (*Med. Rec.*, May 21, '98).

In some cases the epithelium proliferates within the glands, forming more than one layer. Round-cell infiltration and formation of new interglandular tissue may take place, particularly if mild septic infection intervene. In such cases agglomerations of glands surrounded by a small amount of connective tissue project from the surface, forming polypoid masses, which may spring from every part of the mucous surface.

Literature of '96-'97-'98.

Histologically, the epithelium covering the mucous surface is composed chiefly of large, nucleated leucocytes; it is swelled and somewhat distorted. The uterine glands may be normal in part, but the mouths of the glands are very much swelled and there are many pus-

cells present. In chronic endometritis the mucous membrane is highly granular and has an appearance like that of polypi. The term granular endometritis is highly improper, and should be abandoned. Only forty-nine cases of endometritis found in eighteen hundred gynæcological cases at the Johns Hopkins Hospital. The treatment consists in dilating and curetting the uterus. Thomas S. Cullen (*Med. Rec.*, May 21, '98).

The uterine walls are usually also congested, and some round-cell infiltration takes place about the blood-vessels, which, in time, leads to the formation of adult connective tissue. Contraction in this connective tissue may finally cause anæmia of the uterine walls and more or less atrophy of the muscular fibres.

The mucous membrane is hyperæmic, softened, thickened, and dark red in color. In places it may have a mottled appearance, due to minute extravasations of blood. The surface is smooth, sometimes irregular, and is moistened with a thin, clear, grayish or pinkish mucus. The pouting mouths of the congested and enlarged glands are visible. The uterine walls are slightly thicker and the uterine cavity somewhat longer than normal (from $2\frac{1}{2}$ to 3 inches deep from the external os to the fundus). This condition is that of *glandular* endometritis, or *hyperplasia* of the endometrium, and is seldom the result of infection. It is, as a rule, chronic.

During the menstrual periods the congestion is intense, and there is more or less extravasation of blood in the interglandular spaces, and an extensive exfoliation of the epithelium.

When the congestion results suddenly from causes acting during or just before the menstrual period, it is also intense and accompanied by interglandular extravasation and blood-stasis that inter-

fere with the menstrual discharge, and which, if not relieved, runs into the chronic form.

In *acute septic* endometritis the blood-vessels of the endometrium are engorged and increased in number. There is considerable exfoliation and proliferation of the epithelial cells, sometimes to such an extent as to cause a superficial necrosis. The interglandular spaces are crowded with round cells, leucocytes, and cocci which may extend into the muscularis mucosæ and, if streptococci be present, a short distance into the uterine walls. Congestion, extravasation of blood, serous and round-cell infiltration take place throughout the uterine tissue, and a fibrinous exudate may appear on the peritoneal surface.

Eighteen cases of infectious diseases, showing that the blood-vessels of the endometrium were intensely congested, particularly the small veins and the capillaries. Ecchymoses, either in patches or disseminated all over the surface of the mucous membrane, were present. The glandular epithelium was swelled, the cells were desquamated, and the lumina of the glands filled with cells, mucus, and blood-corpuscles. The glands frequently penetrated very deeply into the muscular layer, this being a characteristic sign of endometritis. An hæmorrhagic endometritis was found to be present in all of these cases. Massen (Gaz. de Gyn., Mar. 15, '91).

There is a more or less abundant flow of pus from the endometrium.

In *chronic septic* endometritis round cells and leucocytes crowd the interglandular spaces, compressing the glands and in places penetrating and destroying them. After a time the formation of contracting adult connective tissue compresses and obliterates some glands, and obstructs the mouths of others, converting them into small cysts. The epithelium in the atrophic glands and on the surface also degenerates; so that in

old and senile cases the mucous membrane may be represented by a thin layer of sclerotic connective with only vestiges of epithelial structure.

The uterine walls, at first hyperæmic and infiltrated to a greater or less depth with serum and round cells, are thicker and softer than normal, but later, owing to the contraction of the inflammatory tissue, become hardened. The atrophy of the muscular tissue and absorption of the serum, as well as the senile changes, may finally lead to a diminution in size of the entire organ.

Endometritis occurring in connection with abortion may interfere with the atrophy of the decidua, and masses of decidual cells may be found in the endometrium in connection with the round-cell infiltration.

In some cases the menstrual congestion is so great that an acute attack is practically lighted up at each period. The stroma-cells are enlarged and resemble decidual cells, and the tissues are crowded with leucocytes. The congestion is so great that there is an abundant extravasation of blood in the interglandular spaces, which loosens the superficial portion to the extent of causing its exfoliation in places or even entire, as a more or less complete cast of the uterine cavity.

After the menopause the cervix may become stenotic, and the discharges be retained. The uterine cavity may then become distended, and the uterine walls attenuated by an offensive and purulent fluid.

The menopause does not exercise a curative influence upon endometritis and its resulting leucorrhœa. Jacobs (Amer. Jour. Med. Sciences, Apr., '94).

Prognosis.—The prognosis of acute metritis in the puerperal state or after abortion is grave. The patient may die

of septicæmia, or the disease may extend to the Fallopian tubes, ovaries, and peritoneum, or into the veins or lymphatics of the broad ligament, or it may result in chronic endometritis and subinvolution.

When not connected with pregnancy the disease seldom terminates fatally, but is apt to extend to the adnexa or become chronic.

Acute cervical metritis may end in recovery, but, as a rule, becomes chronic.

Chronic cervical metritis may get well, but, as a rule, it persists for a long time. It can ordinarily be cured either by local treatment or operation.

Chronic corporeal endometritis of the septic variety is apt to get well if there is good drainage through the cervix. Without adequate drainage it becomes chronic and is liable to spread to the adnexa.

Literature of '96-'97-'98.

In the non-puerperal uterus the risk of the inflammation's spreading to the tubes is little save when the cervical canal is obstructed or the infection gonorrhœal in nature. W. P. Carr (*Virginia Med. Semi-Monthly*, Jan. 8, '97).

The prognosis of fœtid endometritis is favorable, though recurrence may occur after curettement. Mansange (*Arch. de Toc. et d'Obstet.*; *Centralb. f. Gynäk.*, No. 21, '97).

In cases of long standing the septic condition can be removed, but the endometrium and myometrium can seldom be restored to a normal state.

The sterility is apt to be permanent.

Chronic glandular endometritis can generally be cured by treatment. Mild or recent cases may get well spontaneously, but severe cases usually persist for a long time, or until the menopause.

Treatment.—For *acute metritis* due to suppression of the menses the flow should be re-established if possible in the early or congestive stage. As soon as possible

after the suppression the patient should take a warm sitz-bath (100° F.), and go to bed. Hot drinks, hot poultices to the abdomen and groins, and hot-water bags or bottles to the feet and legs should be employed. In married women scarification of the cervix may be used with benefit. The production of slight nausea by means of tartar emetic, ipecac, or lobelia is useful as a sedative to the congested pelvic organs. If the menstrual flow is re-established by these means within a day or two, the patient may leave the bed after the flow has ceased, but should lie down two or three hours in the middle of each day, and take but little exercise for three or four weeks. At the time of the next period she should keep to the bed and repeat the hot applications, etc., if the flow does not appear on time. The bowels should be kept open by salines.

If the menses are not re-established within two or three days after their suppression, the patient should remain in bed for a week or ten days, apply counter-irritants over the iliac and suprapubic regions, and take copious hot douches (115° to 120° F.) two or three times daily in the recumbent posture. She should secure a daily evacuation of the bowels and, if practicable, introduce small cotton tampons, saturated with a 10-per-cent. solution of ichthyol in boiled glycerin, high up into the vagina every other day, and leave them for about eighteen hours. Tonics and an easily-digested diet should be prescribed.

Acute metritis following labor or abortion calls for a thorough evacuation of the uterus by the *fingers* or curette, and, if septic symptoms persist, antiseptic intra-uterine douches every twelve hours ($\frac{1}{3000}$ of corrosive mercuric chloride followed by sterilized water or 1-per-cent. creolin) and vaginal douches of the same character every six or eight hours.

Treatment of beginning endometritis by means of medicated steam recommended. Resorcin at $\frac{1}{20}$, and varying in temperature from 104° to 140° F. is used. But slight dilatation of the cervical canal is required, and accidents are thus avoided. The exudations become coagulated and are excreted by means of contractions, causing a mild form of colic. Sordes (*Jour. de Méd. de Bordeaux*, Sept. 1, '95).

Literature of '96-'97-'98.

Excellent results obtained in seven out of eight cases of septic endometritis after labor and abortion by the injection of superheated steam into the uterine cavity. The apparatus consists of a metal can with a spirit-lamp and a thermometer which registers up to 200° C., some rubber tubing, and a catheter. The application lasts about half a minute, and never over a full minute. By means of a tap, the current of steam can be interrupted while the catheter is being adjusted before use, lest scalding or burning should occur. The temperature of the steam must be a little above boiling-point, about 110° C. The jet of steam is followed by no bad effects and gives little or no pain. Uterine contractions are actively stimulated and ill-smelling discharges cease. Steam kills the bacteria in the endometrium, and as it coagulates albumin all blood-vessels and lymphatics are sealed up, and fresh granulations can develop under the protective covering. Kahn (*Centralb. f. Gynäk.*, No. 49, '96).

Excellent results obtained from tincture of iodine in post-partum endometritis. It acts best when used in the early stages and as often as once or even twice daily. As soon, however, as the signs of acute inflammation subside and the secretion diminishes, the remedy should be applied less frequently. Pains of varying character usually follow this mode of treatment. The method of application is as follows: The patient lies on her back, and a speculum is introduced into the vagina. If the cervix is blocked with mucus, the os is drawn down with a volsella, the portio vaginalis is irrigated, and the parts dried with aseptic cotton-

wool; the canal is then swabbed with the pure tincture of iodine. In cases in which the corpus uteri is also involved the remedy is applied in the same way as to the cervix. A. Solowjev (*Wratch*, No. 12, '97).

Bromine-vapor most satisfactory agent in the treatment of endometritis. It is introduced into the uterine cavity through a double-current catheter attached to an atomizer, diffuses rapidly, and exerts a remarkable curative action in cases of acute endometritis and salpingitis. Nitot (*La Gynéc.*, Oct., '97).

When the attack follows an operation, an ice-bag should be kept on the lower abdomen for twenty-four or thirty-six hours, the infected surfaces be thoroughly disinfected by a strong antiseptic, and one of the above-mentioned antiseptic douches be used either to the endometrium or vagina as required.

As the inflammation subsides, hot douches, laxatives, tonics, rest in bed, etc., are indicated.

In chronic uterine inflammation all causes of the diseases and all conditions that perpetuate it should receive attention.

Local and systemic treatment should be combined in chronic endometritis. Much importance is given to spinal treatment by revulsives to the lumbosacral regions. Locally hot vaginal douches and glycerin tampons are employed. Scarification of the cervix is also recommended. Chéron (*Jour. des Sciences Méd. de Lille*, Mar. 16, '88).

Rest in bed, regulated diet, and general hygienic treatment considered of the first importance. Hubert (*Revue de Thérap. Médico-Chir.*, July 1, '88).

Displacements should as far as possible be corrected, stenosis relieved, and pelvic inflammatory conditions and tumors be treated or removed.

Most marvelous results achieved in hæmorrhage depending upon chronic endometritis with chronic peritonitis, by

the hypodermic use of a solution containing $1\frac{1}{2}$ drachms each of crystallized phosphate and sulphate of soda dissolved in 4 ounces of distilled water. From 1 to $1\frac{1}{2}$ drachms of this solution is to be injected into the buttock or thigh twice a week. The solution must be made fresh and filtered each time. Chéron (*Jour. Amer. Med. Assoc.*, Apr. 28, '88).

Literature of '96-'97-'98.

Application of an ethereal solution of iodoform to the cervical canal recommended in obstinate cases. Doléris (*Bull. Gén. de Thér.*, No. 11, '97).

The patient should remain in bed during a portion or all of the menstrual period, and take more than ordinary care of herself after abortions or confinements.

When menstruation is imminent or present, treatment should be withheld. An exception to this rule would obtain should the flow be very profuse or protracted. In the presence of an acute inflammatory process intra-uterine treatment should be withheld. In malignant disease of the cervix, the possibility of severe hæmorrhage's attending local treatment of whatever character must be anticipated and provided for. In all cases the risk of inflammatory reaction in pelvic structures remote from the cervix must be taken into consideration. Currier (*Trans. Med. Soc. State of N. Y.*, Feb., '90).

Stress laid on the complications which endometritis may set up in a patient who becomes pregnant. The acute form is generally secondary. Chronic endometritis attacks the decidua vera. The cause of endometritis is usually gonorrhæa. Syphilitic endometritis is probable. Endometritis cannot be treated as long as the pregnancy lasts. Only when syphilis is suspected can benefit be derived from drugs. After delivery or abortion the endometritis can be treated by the free use of the curette. The increased vascularity of the decidua vera explains the frequency of hæmorrhages during pregnancy. The decidua reflexa is rarely attacked; hence the placenta is usually found healthy, and the child

may be delivered alive. Tarnier (*Jour. des Sages-femmes*, Jan. 1, '94).

Chronic glandular endometritis, alone or in connection with chronic septic or interstitial endometritis, and all menorrhagic cases uncomplicated by pelvic peritonitis should be curetted.

The curette is often used unnecessarily. Delafosse (*Gaz. de Gynéc.*, Jan. 15, '88).

The curette is much safer and more certain in action than caustics. Boreau (*Nouv. Arch. d'Obstét. et de Gynéc.*, Feb. 25, '88).

Curetting is certainly more scientific and less barbarous than the use of caustics. Smyley (*Brit. Med. Jour.*, Feb. 11, '88).

By the treatment of endometritis certain complicating periuterine inflammations will be cured also. Treatment, irrespective of complications, consists in curetting, or, more exactly, in thorough intra-uterine antiseptics. Contra-indications do not exist. Lymphangitis, salpingitis, ovaritis, and peritonitis may all be benefited by treatment of the accompanying endometritis. Cases of salpingitis not extremely painful, and producing a tumor of but medium size, should be submitted to intra-uterine antiseptics and withheld from laparotomy. Trélat (*Annales de Gynéc. et d'Obstét.*, May, '90).

Dilatation, curetting, irrigation, and draining recommended as the best and most rapid method of obtaining a cure. Waldo (*N. Y. Med. Jour.*, Feb. 13, '92); Baldy (*Med. and Surg. Rep.*, Mar. 12, '92); Noble (*Annals of Gynæcology and Pædiatry*, June, '92); Garrigues (*Times and Register*, Apr. 30, '92); Gossmann (*Münch. med. Woch.*, May 31, '92); Thielhaber (*Münch. med. Woch.*, June 28, '92); Goffe (*Virginia Med. Monthly*, Sept., '92).

Sixty-five cases of endometritis fungosa treated by curetting; 92.2 per cent. completely cured; 13.8 per cent. much improved. Should be performed with patients in Sims's position. Hans Vogelbach (*Inaugural Dissertation*, '94).

The most thorough results are ob-

tained when both the curette and the sharp spoon are used, especially the smallest-sized instruments, which can be inserted into the cornua of the uterus and between the rugæ. Where there is marked glandular hyperplasia, early recurrence is apt to follow the most vigorous scraping unless the raw surface is thoroughly cauterized at once. R. Werth (*Archives f. Gynäk.*, B. 49, H. 3, '95).

In 297 cases treatment consisted of dilatation and curettage of the uterine cavity, followed by thorough application to the endometrium of 50-per-cent. solution of chloride of zinc in the worst cases, and of a solution of iodized phenol in milder cases. A sterilized drain was then inserted through the internal os, the patient put to bed, and all precautions taken against inflammatory reaction. A repetition of the cauterization with milder solution, if thought best, usually resulted in a permanent cure in the course of two or three weeks. There were 197 cures and 94 cases of improvement out of 297 operations, only 6 being mentioned as discharged unimproved. The best hope for a permanent cure of chronic endometritis would result from impregnation and normal delivery. Paul F. Mundé ("Report of Gynecological Service at Mount Sinai Hospital," '95).

In acute catarrhal endometritis electricity is an effective remedy, faradization and the negative pole of the galvanic current fulfilling the requirements of local treatment. In chronic catarrhal endometritis the positive pole of the galvanic current and zinc electrolysis, combined with faradization, are also effective. Acute septic or specific endometritis demands gentle dilatation and thorough irrigation with antiseptic solutions. In chronic endometritis resulting from septic or specific infection, curettage, gauze drainage, and subsequently irrigation. Senile endometritis can best be overcome by dilatation and drainage brought about by means of the negative pole of the galvanic current, and, when necessary, irrigation of the cavity with a saturated solution of boric acid or Thiersch's solution. A. H. Goelet (*Amer. Jour. of Obstet.*, Sept., '95).

Literature of '96-'97-'98.

Cauterization of the uterine mucosa is most dangerous. A careful and aseptic curettage is the proper treatment to apply to all forms of complicated and uncomplicated endometritis.

The contra-indications are: Well-established pathological changes in the adnexa and chronic periuterine inflammation. Charles C. Cumston (*Med. and Surg. Reporter*, Feb. 15, '96).

Hæmorrhagic endometritis in virgins should be treated by curetting. Blanc (*Loire Méd.*, Dec., '96).

Not all cases of endometritis require local treatment; in every case the general health must be thoroughly looked after. In the acute forms drainage and rest in bed are the main points in the treatment. In the chronic forms, where the endometrium is extensively diseased, the treatment consists in the establishment of thorough drainage by dilating the cervical canal, never by the use of tents of any kind, and thoroughly scraping the diseased endometrium so as to remove the entire epithelial layer, but not the entire endometrium, followed by thorough intra-uterine douching with boiled water and packing the body of the uterus firmly with an antiseptic gauze, allowing it to extend loosely through the cervical canal. This is entirely removed at the end of twenty-four, at the longest forty-eight, hours, and the uterus not repacked. Ralph Waldo (*N. Y. Med. Jour.*, Jan. 4, '96).

The cause of the frequency of incomplete cures in the treatment of endometritis by curettage is the absence of further medication. Planellas (*Annales de Gynéc. et d'Obstét.*, Oct., '96).

When the curette is employed due care should be exercised. Rough manipulation and undue pressure upon the uterine surfaces have been followed by untoward results. Curettage should be avoided when there is tenderness in the tissues beside the uterus.

Case in which perforation with curette ended in death. Raffay (*Thèse de Paris*, '95).

[Uterus punctured in a number of

cases and in none of them have any abnormal symptoms resulted. E. E. MONTGOMERY, Assoc. Ed., Annual, '96.]

Temporary uterine paralysis occasionally occurs during the operation of curetting under chloroform narcosis, which might lead one to think that he had perforated the uterine wall and was moving the curette freely in the peritoneal cavity, were it not for the absence of shock, as manifested by the normal pulse, respiration, and appearance of the patient. Geyl (*Archiv f. Gynäk.*, H. 3, '88).

The greatest danger of the curette does not lie in perforating the walls of the uterus, but in salpingitis, the excitation of peristaltic movements, and the forcing of material into the peritoneum. The worst procedure that can be imagined in this connection is to follow curetting by injection. Landau (*Med. Press and Circ.*, Dec. 5, '94).

Case of death reported resulting from an intra-uterine injection of perchloride of iron. The patient was curetted for endometritis, and, owing to the bleeding, the following day iron was carefully injected drop by drop. She died two hours later. At the post-mortem clots were found in the uterus and thrombi in the iliac veins. Pletzer (*Provincial Med. Jour.*, Aug., '92).

Four cases noted where death has occurred from septic peritonitis after curetting. Reeves Jackson (*Annals of Gynec.*, Apr., '88).

Regeneration of endometrium after curetting varies widely, according to manner in which operation performed. Where there is marked glandular hyperplasia, early recurrence apt to follow most vigorous scraping unless raw surface cauterized at once. When liquor ferri applied after curetting, regeneration of epithelium delayed. R. Werth (*Archiv f. Gynäk.*, B. 49, H. 3, '95).

Fifteen days a minimum limit for the uterine mucosa to reproduce itself so as to be physiologically active after curetting. Bossi (*Gaz. degli Osp.*, Feb. 2, '95).

Exfoliative endometritis and polypoid endometritis may require more than one curettage.

In a large proportion of cases the cervical canal is small or bent, and must be kept dilated for several weeks subsequently to promote uterine drainage.

Iodoform-gauze packing does not drain at all. H. J. Boldt (*Amer. Jour. of Obstet.*, Sept., '95).

Term "packing" a misnomer. Tight packing only indicated in certain conditions to stimulate contraction of uterus. Goelet (*Amer. Jour. of Obstet.*, Sept., '95).

Introduction of a gauze pad or drain into the non-puerperal uterus for the purpose only of drainage is unnecessary and possibly open to objection. While the presence of a pad of gauze in a flabby, septic uterus after curetting may produce contraction of that organ, still it acts as an obstacle to the escape of septic discharges. H. C. Coe (*Amer. Gynec. and Obstet. Jour.*, June, '95).

In others it is necessary to use strong astringents and antiseptics to the endometrium, to counteract the tendency to a recurrence of the hyperplasia or the sepsis.

The hot vaginal douche twice daily acts beneficially as a sedative to the pelvic circulation, and aids in keeping the vagina clean.

Local treatment may be commenced in two or three weeks after the operation. If the cervix is small or bent, a round dilator, or male urethral sound No. 12 to No. 15, should be passed through the internal os once or twice a week. In order to avoid infection, the patient should take a large hot vaginal douche shortly before the treatment, and the gynecologist should wipe out and disinfect the vaginal fornices and cervix through the speculum before introducing the disinfected sound.

After the sound is withdrawn a 50-per-cent. solution of ichthyol in glycerin may be applied to the endometrium, or, if the case has been an hæmorrhagic one,

pure lysol or carbolic acid, or a 20-per-cent. solution of chloride of zinc, every ten days to two weeks.

Carbolic acid most efficient and safest application. Does not burn deeply enough to destroy submucous tissue. Not good practice to make traction upon organ and pack it every other day. A. P. Dudley (*Amer. Jour. Obstet.*, Sept., '95).

For the treatment of cases of mild uterine catarrh a solution of zinc chloride is most satisfactory. The treatment is commenced eight days after the termination of menstruation, and in the absence of any pain in tissues contiguous to the uterus or ovaries. The vagina and cervix uteri are first irrigated with a hot 15-per-cent. solution of boric acid combined with 1 to 200 solution of sublimate. The uterine cavity is then carefully cleansed of all mucus and a 5-per-cent. solution of the chloride of zinc applied over the entire surface of the mucous membrane. This operation is repeated two or three times at intervals of eight days. Should there be fungosities, or should the ulceration not yield promptly to the zinc treatment, one may employ a solution of chromic acid. Great care must be used that these solutions are applied only to the diseased tissues, and after their use the tissues should be again irrigated with the antiseptic solution. Vergely (*N. Y. Med. Jour.*, Mar. 22, '90).

Treatment by chloride of zinc given up because of the tendency of this agent to produce cicatrization of the surface. A. Jacobi (*Med. Record*, Oct. 19, '95).

Action of the sulphate of copper is a superficial one, not producing the deep eschar made by chloride of zinc, and it is just as effective as zinc, and does not produce atresia of the cervix. Cases cured by the copper treatment in from four to twenty-five days. Only one application was made. As a preliminary step, strict antiseptics of the genital tract recommended, rest in bed, giving bromide one day previous, repeating it, and, if necessary, a uterine injection of chloral. Arnaud (*Bull. Gén. de Thé.*, May 15, '92).

Literature of '96-'97-'98.

More general use of nitrate of silver advocated in the treatment of endometritis. The application of the nitrate of silver should be made carefully and thoroughly, and to do this it is absolutely necessary that all unhealthy secretions should be removed previously from the interior of the uterus, and the latter be left clean and dry. For mild cases and those seen early 5- or 10-grain solution of nitrate of silver used, but the more chronic cases require much stronger solutions or even a light touching with the solid stick. Wm. H. Robb (*N. Y. Med. Jour.*, Dec. 5, '96).

Applications of nitrate of silver are followed immediately by an apparent improvement or cure; but further observation will show that the treatment has left an atrophic, non-secreting, and irritable endometrium. There is no such objection to the use of the curette. L. J. Brooks (*N. Y. Med. Jour.*, Dec. 5, '96).

Three-per-cent solution of lactic acid injected into the vagina overcomes the odor that may be present in cases of leucorrhœa, changes the color of the discharge, and may be used without danger in ambulatory practice and in cases of salpingo-oöphoritis. In certain cases the intra-uterine employment of a stronger solution may be substituted for the use of the curette. Ilkewitsch (*Cent. f. Gynäk.*; *Texas Med. News*, Dec., '97).

When there is tenderness or irritation in the tissues beside the uterus, curettage and intra-uterine medication are liable to do more harm than good. In such cases a copious hot vaginal douche (120° F.) should be taken at or near the noon hour, followed immediately by two hours of rest in the recumbent position, and another douche at bed-time followed by the introduction into the vaginal vault of a tampon saturated with a 10-per-cent. solution of ichthyol in glycerin. The tampon is removed when the noonday douche is taken.

Laxatives, tonics, massage, regulated

out-of-door exercise, and restriction of coitus are useful adjuvants.

Good results from intra-uterine galvanism. Lapthorn Smith (Amer. Jour. of Obstet., Sept., '95).

Literature of '96-'97-'98.

For catarrhal endometritis an hypodermic of strychnine and atropine each morning, and at night a cold salt-water bath followed by vigorous rubbing with Turkish towels advocated. J. E. Free (Amer. Jour. of Obstet., Mar., '96).

Endometritis with stenosis and pyometra (so-called senile endometritis) should be treated on the same principles as any pus-cavity, viz.: dilatation of the cervix for drainage, and the washing out of the uterus with antiseptic solutions once or twice daily.

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ENTERIC FEVER. See TYPHOID FEVER.

ENTERITIS. See INTESTINES.

ENTROPION. See LIDS, DISEASES OF.

ENURESIS.—Gr., *ἐνουρῆσις*, to urinate in; from *ἐν*, in, and *ὀύρον*, urine.

Definition.—Involuntary discharge of urine; incontinence of urine.

Symptoms.—If we may speak of the symptomatology of this affection, which in itself, in the majority of instances, is to be regarded as a symptom, rather than as the actual disease, the ground is amply covered by the single statement which is usually detailed by the parent or the patient, that there is an involuntary passage of urine. Manifestations of a neurotic character are frequently found associated with enuresis.

It is not a very difficult matter to discover the presence of the trouble under consideration, but the determination of the cause or the causes for its existence is by no means so easy and is sometimes rendered impossible.

Enuresis is not liable to be mistaken for any other affection, with the single exception of the incontinence, or overflow, symptomatic of retention of urine due to prostatic enlargement or some other obstruction to the genito-urinary track, from the bladder, outward.

Etiology.—Incomplete development of the sphincter muscles, existing in the infantile period, may persist for an abnormal time (beyond the second year); when this occurs, it is followed by the involuntary emission of urine.

If the urethral resistance be too weak or the vesical expulsive force too strong, incontinence obtains; in children, until the contractility of the sphincters comes into play, and, later on, the voluntary muscles begin to be trained, this incontinence is normal. Picard (Concours Méd., May 26, '88).

Enuresis is rarely the result of any nervous irritability of the bladder, and the indiscriminate use of nervous sedatives, as belladonna, in such cases, should be avoided. It is lack of power of retention, due to enfeeblement of the voluntary portions of the sphincters of the urethra and at the apex of the prostate. Editorial (Jour. Amer. Med. Assoc., Nov. 3, '89).

Incontinence of urine in children depends upon insufficiency of the sphincter vesicæ muscle, which allows the urine to enter into the upper part of the urethra, whence it is expelled by a reflex action of the detrusor urinæ muscle. Patients should sleep upon a bed with the foot-end raised, thoroughly empty the bladder, and take no fluids before retiring. Van Tienhoven (Wien. med. Presse, Aug. 24, '90).

Enuresis may be caused by debility of the neck of the bladder and of the internal sphincter; insufficient innervation

from disease of the spinal cord and of the nerve-centres; reflex irritation; masturbation; an overdistension of the bladder with urine; changes in the constitution of the urine. Carpenter (Phila. Polyclinic, Oct., '93).

In a number of cases enuresis may be a local manifestation of a general lack of tone of the entire muscular system.

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In many cases of enuresis the fact noted that the majority suffered from marked nutritive disturbances. In comparatively few cases can the disorder be attributed to reflex causes alone. Even where there are no gross evidences of malnutrition, the metabolic activity in the sensitive nerve-cell is probably disturbed. Hence, strychnia is recommended, on the whole, as the most valuable drug. A study of individual dietetic needs is most important in every case. McKee (Phila. Polyclinic, Oct. 17, '96).

Diseases of the nervous system, both functional and organic, are recognized as factors in producing this disease.

Incontinence in children believed to be due to congestion of the medulla. Harkin (Jour. Amer. Med. Assoc., July 28, '88).

The condition at fault is either diminished activity of the vesico-spinal centre or a partial anæsthesia of the sensory nerves of the bladder. Kupke (Lancet, Nov. 22, '90).

Incontinence of urine in children is a true neurosis and not, as a rule, due to muscular incompetency of the sphincter vesicæ. It rests upon excitability of the nerve-centres produced by heredity and age; anæmia with consequent malnutrition, increasing the excitability of the nerve-centres, and reflex irritation. Rachford (Archives of Ped., Nov., '93).

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Incontinence of urine inherited from father by family of five girls and one boy. The two elder children, girls, are always more affected toward the men-

strual period. The incontinence affects most all of the children alike by day and night. Two of the children were subject to fits which began during early childhood; and they showed also other signs of degeneracy. Monro (Lancet, Mar. 14, '96).

Affections of the spinal cord which lead to incontinence are rare in childhood. Enuresis frequently is found associated with epilepsy.

As to the local conditions which produce incontinence, there may be mentioned, overdistension of the bladder with urine; hyperacidity of the urine; cystitis; phimosis, or an adherent prepuce, either of the glans penis or of the clitoris; nephritis; pyelitis; vesical and renal calculus; glycosuria; masturbation; and rectal irritation.

Of 355 boys and 176 girls, taken at random among the lower and middle classes, 21.5 per cent. were found to be incontinent, the limit of normal continence being placed at three years. Among the 77 incontinent cases, 42 were boys, 35 girls; in 47 incontinence was only nocturnal, in 2 only diurnal, and in 28 both nocturnal and diurnal. In 63 it continued from infancy; in 14 it came on after primary incontinence of infancy had ceased. Townsend (Boston Med. and Surg. Jour., Feb. 16, '88).

Enuresis among children more prevalent in winter than in summer. Buckingham (Boston Med. and Surg. Jour., Mar. 15, '88).

In 14 cases of nocturnal incontinence, præputial adhesion found in 12, and in every case cure followed. The widespread employment of circumcision condemned; the probe or manual force to be employed in breaking up the glandulo-præputial adhesions. Burke (Mass. Med. Jour., Feb., '88).

Number of ducts (of Cowper's glands and of the seminal vesicles) open into the deep urethra, and inflammatory action in or about these structures has been noted even in early infancy, under which circumstances a reflex inconti-

nence may readily be aroused. Oberländer (Berl. klin. Woch., July 23, '88).

Case showing reflex causation. A boy long treated in vain for enuresis had calculus removed from the nose, the nucleus of which proved to be a boot-button, then recalled as having been thrust into the nose eight years before. The removal was followed by an immediate and permanent cure of the incontinence. Nichols (Boston Med. and Surg. Jour., Mar. 15, '88).

Forty cases of urinary incontinence among the soldiers in the military hospitals of Moscow analyzed. In the majority of these cases there existed anæsthesia of the mucous membrane of the bladder and urethra, and in some anæsthesia extended over considerable areas of the body. In 10 cases there was a history pointing to heredity. Oserezkowski (Neurol. Centralb., Apr. 1, '89).

Attention called to the probable relation between mouth-breathing and nocturnal incontinence. The nature of this relation is not clear; but in several cases removal of the naso-pharyngeal disease effectually arrested the nocturnal enuresis. Koerner (Centralb. f. klin. Med., No. 23, '91).

Contraction of the bladder may cause incontinence. Case of a single woman, aged 30, in which bimanual examination revealed the fact that there was practically no bladder, it being merely represented by a small hard lump about the size of a walnut. Mayo Robson (Brit. Gynæc. Jour., Aug., '95).

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In eight cases of diurnal enuresis observed by the author he found the existence of bacteriuria. The urine, obtained with all the necessary precautions, contained the coli bacillus. For the treatment the author resorts to lavage of the bladder with a solution of nitrate of silver and internal antiseptics, such as salol, but the bacteriuria resists for some time. Lyder Nicolaysen (Norsk Magazin f. Læger, p. 1012, '96).

Case in which nocturnal incontinence came on quite suddenly in a woman of forty-five. Examination disclosed in Douglas's pouch a tumor of about the

size of a small egg, very hard, and increasing rapidly. The tumor, which was removed by Pozzi, proved to be an ovarian cyst. The incontinence disappeared with the removal of the tumor. Henri Picard (Jour. de Méd. de Paris, Apr. 3, '98).

Children are liable to fissure of the anus with far greater frequency than is generally believed, and this may excite involuntary urination. Constipation and the presence of worms (mostly ascarides) are among the more common causes of this disease.

Prognosis.—When the cause can be discovered and removed, the prognosis is favorable; in elderly people, however, the affection is generally due to paralysis or deep-seated disease of the urinary organs. The outlook is usually favorable in cases of enuresis nocturna. Sometimes, however, it proves to be a very obstinate malady.

Treatment.—Unless the cause be discovered and its removal effected, the treatment of this disease must then be empirical.

Atonic conditions, in children as well as in adults, often lie at the foundation of the lack of control over the passage of urine, and, in these cases, out-door exercise should be advised and a carefully-selected diet prescribed for its nutritiousness and digestibility.

Medicinally, the use of ferruginous preparations are indicated. The syrup of the iodide of iron is readily taken by children. For adults, the pepto-mangan (Gude) is an excellent tonic. The dose of the first is from 3 drops upward, well diluted with water; and of the second a dessertspoonful to a tablespoonful, in milk or wine. Jacobi speaks highly of the elixir pepsinæ, bismuthi, et strychninæ of the National Formulary, in insufficient gastric digestion associated

with atony of the stomach; a child of three years taking a teaspoonful three times a day.

Incontinence due to a weakness of the sphincter muscle is best relieved by ascending doses of strychnine or the tincture of *nux vomica*.

Case of incontinence of urine, of twenty-five years' standing, cured by the dosimetric use of strychnine. Chazaraïn (*Dosimetric Med. Review*, Dec., '90).

Douching of the perineum with cold water is advised, or the application of the faradic current, one electrode being placed in the rectum and the other over the perineum in the male and the mons veneris in the opposite sex. The current is to be gradually increased.

In girls the urethral electrode should be applied to the entire urethra, not entering the bladder or getting outside the meatus. The negative pole employed in the urethra and the positive not to the hypogastrium or loins, but to the thighs. Jamin (*Annales des Mal. des Organes Genito-Urin.*, June, '89).

Enuresis in the female treated, with excellent results, by introducing metal catheter, five to seven centimetres deep, into the bladder. While the index finger of the right hand closes the end of the catheter, the left index finger is placed on that part of the catheter which is just outside of the meatus urinarius, and firm, but elastic, pressure is exercised by this finger, first downward and then to either side. In this manner the sphincter vesicæ and the muscles of the urethra are forcibly stretched. Sânger (*Weekly Med. Review*, June 20, '91).

Case of boy afflicted with nocturnal enuresis since birth cured by the use of the induced current, applied twice a week, one pole in the membranous portion of the urethra, the other in the hypogastrium. No benefit noted until after six weeks of treatment, when periods of remission set in and persisted until complete recovery. Picard (*Jour. de Méd. de Paris*, June 30, '89).

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Case of involuntary enuresis successfully treated by means of Morton's induced static currents, furnished by the oscillatory discharge of Leyden jars connected with an electrical machine. The patient is not insulated, but is connected with one of the jars, while the other is connected with earth. The intensity of the current is regulated by merely altering the distance between the jars. A sound, the end of which formed an electrode, is introduced into the urethra as far as the sphincter of the bladder, and its free end is attached by a chain to one of the Leyden jars; the machine is regulated to give 6 to 8 sparks a second, and each sitting lasts five minutes. Capriati (*Arch. d'Élect. Méd.*, Mar. 15, '98).

If incontinence is due to hyperæsthesia of the mucous membrane or irritability of the bladder, the remedy indicated is belladonna.

Baruch, Watson, and other observers bear testimony to the efficiency of this drug in the treatment of the nocturnal form of incontinence. Both belladonna and atropine are tolerated in much larger doses by children, in proportion to their size or age, than by adults.

In 30 cases treated with atropia 23 reported cured. Watson (*Archives of Ped.*, Oct., '89).

Progressive doses of atropine up to $\frac{1}{30}$ grain, three times daily, given to a child 9 years old. Satterwhite (*Amer. Pract. and News*, June 30, '94).

In many cases a single evening dose of the extract of belladonna (gr. $\frac{1}{4}$ to $\frac{3}{4}$ to 1) or of the sulphate of atropine (gr. $\frac{1}{100}$ to $\frac{1}{75}$) answers sometimes to an unexpected degree, according to Jacobi. In most cases, however, belladonna or its alkaloid must be pushed to the extreme limit before an impression is made upon the disease.

Habit, which Tyson mentions as sometimes the cause of enuresis in children,

may be corrected, as suggested by this author, by encouraging the cautious practice of holding the water.

Masturbation, phimosis, adherent prepuce, rectal affections, etc., must receive appropriate treatment, after which the incontinence of urine, if it persists, will demand attention.

Forceible dilatation of the contracted bladder by means of tepid water urged. The treatment must be continued for several weeks, or even for months, before a cure will be obtained. H. Marion Sims (*Internat. Jour. of Surg.*, Jan., '90).

In the operative treatment of incontinence of urine of urethral origin, a large bougie being introduced into the urethra, a circular incision is made around the meatus about one-half centimetre from its margin, and the canal dissected up to the extent of about one and a half centimetres. The tissues of the vestibule are then incised vertically to the base of the clitoris. The bougie now being withdrawn, the urethra is rotated upon its axis nearly 120 degrees, and drawn at the same time forward and upward into the angle of the bleeding surface produced by the vertical incision of the vestibule. It is fixed in this position by a series of catgut sutures, reuniting it to the tissues of the vestibule, from which it had been isolated. Instead of suturing the lower third to the neighboring parts, the author reunites between them the lips of the gaping wound resulting from the elevation of the urethra to the root of the clitoris. Pousson (*Arch. Clin. de Bordeaux*, June, '92).

Sir Henry Thompson strongly advocates the application of nitrate of silver to the urethra, whether in the male or the female. He states that the use of a flexible bougie, small, of course, for children, passed daily, and removed in a minute or so, is sometimes successful.

Considerable success obtained by dilating the urethra in the incontinence of young chlorotic women. Von der Goltz (*N. Y. Med. Presse*, May, '88).

If this fails, the injection by means of a sufficiently long tube of the nitrate-of-silver solution to the prostatic portion of the urethra and neck of the bladder is a remedy of no mean value. For young women up to the age of 18 or 20 in whom this malady still exists, Thompson has found this treatment almost invariably successful. It should be applied immediately after the bladder is emptied, in quantity, say of a drachm, and of a minimum strength of 10 grains to the ounce, up to treble that strength if necessary for subsequent application. Enough should be employed to produce smarting, which should continue for a day or so. A week or two should elapse between each application.

Some authors advise blistering the perineum, others the use of the actual cautery, touching the same at several points around the anus. J. William White and Edward Martin state that when a habit of nocturnal incontinence is due originally to carelessness—the child, though awakened by the desire to urinate, prefers to wet the bed to getting up—that such cases may be cured by having the patient waked at about one or two in the morning, or at an hour before the habitual time of involuntary micturition, and made to empty the bladder.

Cases of nocturnal incontinence of urine in children that yielded readily to suggestion. Wetterstrand ("*Hypnotism*," '90).

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Hip elevation in the treatment of this condition is a valuable adjuvant. Whatever plan is followed, the restlessness of the child will almost certainly frustrate the object of the treatment, namely: the maintaining of the position a sufficient length of time each night or the required number of nights to effect a cure. E. R. Bradley (*Southern Calif. Pract.*, June, '96).

Incontinence of urine may be asso-

ciated with many and varied morbid conditions, in which it plays a very important part. It may be the first symptom to call attention to such serious disorders as diabetes, calculus, hydronephrosis, and others. In nocturnal epilepsy incontinence of urine may furnish the only evidence of past attacks. Its persistency beyond infancy is probably owed to imperfection of control, unless it be referable to bad habits and poor training. Awakening the child at stated intervals to micturate will cure the vast majority of cases. In addition to the last, restricting the liquids in the child's dietary during the latter hours of the day. In obstinate cases, however, if on examination the urine presents a high specific gravity and a high degree of acidity, instead of limiting the liquids, the child should be made to drink freely toward the end of the day. In a few cases by this reversal of the common practice signal success has been scored. Of drug treatment, belladonna takes first rank. One single dose should be given in the evening, and increased gradually every four or five days. Circumcision in continence of urine, without phimosis, is uncalled for. J. A. Coutts (Treatment, vol. i, Part 1, No. 13, p. 289, '97).

Among other remedies employed in this affection are antipyrine, rhus toxicodendron, potassium bromide, monobromide of camphor, and ergot.

Antipyrine recommended in incontinence of children. Out of 37 cases, 19 were completely cured, 15 much relieved, and in but 3 was there total failure; 7 to 15 grains to be given in the evening after 8 P.M., or so that the last dose be administered after this time. The drug is usually well borne by children. Gundez (Lancet, Aug. 8, '91).

The action of *rhus aromaticus* in this affection is similar to that of strychnine, and is followed by beneficial results. Descroizilles (Revue Gén. de Clin. et de Théor., May 11, 18, '89).

Rhus aromatica given in 18 cases: in 12 with excellent results. The other 6 were all secondary or symptomatic of

some grave condition. Gündoben (Med. and Surg. Reporter, Nov. 10, '88).

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Fluid extract of *rhus aromatica*, 2 to 15 drops three times a day, used with good results in incontinence of urine in children. If the urine is acid and high colored, it is well to begin the treatment by giving an alkaline mixture, as

R Potassium citrate, 2 drachms.

Spirit of nitrous ether, 4 fluidrachms.

Simple syrup, 1 fluidounce.

Water, sufficient to make 3 fluid-ounces.

A teaspoonful in water every two or three hours. H. B. Carpenter (Phila. Polyclinic, Sept. 5, '96).

Report of efficacy of liquid extract of *rhus aromatica*, based upon the results obtained in 30 cases, in which a sufficiently-long time had elapsed since their discharge (nine months to two years). Those which had already been treated with belladonna, strychnine, or tonics generally, but without apparent success, were at once put on *rhus aromatica*, whereas the others who had not been treated for enuresis before had to undergo a preparatory treatment. This consisted in regulation of diet, sleeping on a hard mattress, the use of light coverings, and cold sponging along the spine. The parents were directed to take their children up once or twice during the night, and to make them pass water.

The dose employed was:—

5 to 10 minims for children 2 to 5 years old.

10 to 15 minims for children 5 to 10 years old.

15 to 20 minims for older children.

A very convenient formula being:—

R Ext. *rhus aromaticæ* liq., 10 minims.

Syrup. *aromatici*, 20 minims.

Aq. *destillatæ*, ad 1 drachm.

Sig.: Three times a day.

Thirty-three days on an average were sufficient to produce a permanent cure; 53 days to effect a permanent improvement.

Eleven boys and 7 girls were permanently cured; 1 boy and 9 girls were

permanently relieved; in 2 girls no improvement could be achieved. A relapse occurred in 3 girls after an interval of some months. A temporary exacerbation of the enuresis was noted in 8 cases: 3 boys and 5 girls; it occurred during or toward the end of the first week in 5 cases and during the second week in 3 cases. Ludwig Freyberger (Treatment, May 12, '98).

Case of a boy, aged $2\frac{3}{4}$ years, who had been under treatment for some time without effect, although all the ordinary medicinal and hygienic measures had been tried. By mistake the child took four times, daily, a pill which had been prescribed for the mother, which contained ext. cannabis Indica, gr. $\frac{1}{4}$; hyoscyamine, gr. $\frac{1}{400}$; and zinc phosphide, gr. $\frac{1}{8}$. The enuresis ceased within three days and has not returned. The pills were continued for two weeks with no ill effects. Alfred Hand, Jr. (Med. and Surg. Reporter, Mar. 31, '98).

With ergot I have had personal and very favorable experience. Normal liquid ergot was employed, in doses of 20 drops to 2 fluidrachms, in water thrice daily.

The unpleasant odor emitted by persons suffering from incontinence of urine can be conveniently covered by means of 10-drop doses of turpentine administered in milk and water three times a day. This converts the ammoniacal emanations into an odor resembling that of violets. The remedy is perfectly harmless in most cases, and has been given for many weeks at a time without any inconvenience. It is, however, contra-indicated in ulcer of the stomach, gastric catarrh, and nephritis, and also in persons in whom turpentine tends to cause disorder of the digestive functions. Emminghaus (La Semaine Méd., Aug. 22, '94).

LEWIS H. ADLER, JR.,
Philadelphia.

EPIDEMIC CATARRHAL FEVER.

See INFLUENZA.

EPIDIDYMITIS. See TESTICLES,
DISEASES OF.

EPILEPSY.—From *ἐπιλαμβάνειν*, to fall upon or seize.

Synonyms.—Morbus sacer; falling sickness.

Definition.—Epilepsy may be defined as a disease characterized by the habit of having convulsions, attended usually with unconsciousness, the seizures occurring suddenly and at irregular intervals, the subject showing an essential tendency to progressive mental and motor weakness.

Varieties.—The generic term epilepsy is applicable to and includes numerous subtypes, some of which differ from each other symptomatically and otherwise most markedly; hence the necessity for a classification of varieties. We have, for example, a division into two forms expressive of a difference in the degree and intensity of the motor spasm and impairment of consciousness in the attack—major and minor epilepsy, or, as the French express it, *grand* and *petit mal*. Other synonyms are general and partial, and, in a more restricted sense, frank or masked epilepsy. In *grand mal* both consciousness and motor spasm are involved in profound degrees. In *petit mal* both consciousness and motor spasm may be only slightly and transiently involved. In *general* epilepsy the motor spasm may involve all the muscles of the body and the loss of consciousness may be absolute. In *partial* epilepsy only one extremity or even one set of muscles may be affected and consciousness only slightly if at all perceptibly impaired.

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The distinction between partial (Jacksonian) and true epilepsy is not a sharp one. The partial may end in general convulsions, with loss of consciousness; on the other hand, chronic convulsions in true epilepsy may occasionally be limited to a certain part of the body,

and not be with unconsciousness. H. Higier (Neurol. Centralb., No. 4, '97).

Partial epilepsy is, perhaps, more readily recognizable under the name *Jacksonian*, or cortical, epilepsy: terms more popular, since they embody facts of etiological and pathogenic, as well as symptomatic, significance. The term "cortical" is, however, utterly indefensible here, since we have good reason to believe that all epilepsies are essentially of cortical origin. In masked epilepsy there may be neither motor spasm nor apparent unconsciousness, but certain phenomena of abrupt onset in the psychical or motor volitional sphere may occur which, by reason of their habitual recurrence in the same or similar form, constitute a variety of the disease; automatic, causeless, but apparently purposive movements may represent the entire motor explosion. A transient stupidity or absence of mind—perhaps a random or irrelevant remark—may be the only evidence of impaired consciousness. Certain vasomotor disturbances, such as pallor, flushing, etc., usually accompany attacks of this character. In certain cases, first described by Weiss and to which he gave the name "psychical" epileptics, the explosion is, objectively at least, entirely in the direction of disturbed mental equilibrium, such patients being subject to irregularly and abruptly recurring paroxysms of transient insanity, usually with an aura, or warning, and with no recollection subsequently of the attacks. Such seizures, as well as other less marked, but irregularly recurring psychical disturbances, are described by other writers as epileptic psychical equivalents.

The element of periodicity in the time of occurrence of the attack, a factor of some importance in both prognosis and treatment, has served as the basis for a

chronological division into diurnal, or day, and nocturnal, or night, epilepsy, the former being still further divisible into the matutinal, or morning, and the vesperal, or evening, cases. In the succeeding paragraphs upon symptoms we shall find evidence of the necessity for a further elaboration of subtypes.

Symptoms.—The symptom-picture in epilepsy varies quite widely, as has been intimated in the classification and description of subtypes. Not only is there a marked difference symptomatically in these clinical subvarieties, but each individual patient may differ in some major or minor particular from all others, although preserving in each instance some essential factor revealing a common identity. In typical grand mal the patient, with or without an aura, or warning, is suddenly seized with a convulsion, attended with unconsciousness of greater or less degree. There is simultaneously a sudden alteration in color, either lividity or pallor, and the unconsciousness may be preceded or attended by an involuntary cry or scream. The patient falls unconscious regardless of surroundings, the muscles of the face and extremities become extended in rigid tonic, followed quickly by clonic spasm; frothy saliva, sometimes mixed with blood, escapes from the mouth; breathing becomes labored or stertorous from spasm of the respiratory muscles; the sphincters relax, allowing involuntary escape of urine, feces, and sometimes semen; the whole convulsive attack lasting from a few seconds to ten minutes or longer. This convulsion is followed, in typical cases, by a deep semicomatose sleep, lasting from a few minutes to several hours, the patient on awakening remembering nothing or very little of anything which occurred subsequent to the beginning of the convulsion.

On account of its association with epilepsy, *status epilepticus* should not be considered a distinct disease, but merely a climax of the neurosis. It consists of two stages: (a) a convulsion and (b) a comatose state, though the latter is sometimes supplanted by a period of maniacal excitement. There is no demonstrable lesion causative of the *status*. Trowbridge and Mayberry (Jour. Amer. Med. Assoc., Nov. 7, '91).

The aura is simply an hallucination of cortical or reflex origin, according as the epilepsy is central or reflex in nature. The loss of consciousness is due to a phenomenon of arrest, bearing especially on the neurons of association. The fall is one of the motor phenomena, and is not due to the loss of consciousness. The later symptoms are due to the modifications of the cellular elements. Marinesco and Sérioux (Gaz. Hebdom., Nov. 23, '95).

Immediately after spasm the pulse-curve is dicrotic or polycrotic, with rounding of the apex, or even with a flattened apex. Experiments made on healthy subjects showed that after violent muscular efforts of the arms the same modifications of the pulse-curve are present. This tends to show that modifications of the curve are due simply to muscular effort, and that sphygmographic study will prove of no assistance in distinguishing between true and false (imitated) epileptic spasms. Féré (Nouv. Icon. de la Salpêtrière, May, June, '88).

In a fully-developed, artificial, cortical epileptic attack, during the stage of tonic convulsion the cardiac action is slower and the arterial tension greater, while in the chronic period the heart acts more rapidly. François-Franck (La Semaine Méd., Aug. 6, '88).

A calorimetric examination and an enumeration of the globules of the blood of epileptics have shown that the number of red globules increases, while that of oxyhæmoglobin diminishes with an attack of epilepsy, and these red globules assume, examined in serum immediately after paroxysm, a spherical form, while at the same time their diameter diminishes. Féré (Le Progrès Méd., Mar. 23, '89).

In 50 per cent. of persons affected with epilepsy there is some albumin present in the urine when the paroxysm is over, the increase of it bearing a proportion to the severity, and being largest in cases where the cutaneous cyanosis and congestion have been most demonstrated. J. Voisin and A. Péron (Archives de Neurol., May, '92).

Development of spots of alopecia circumscripta frequently observed on the scalp of epileptics immediately succeeding a severe seizure. Without any treatment. J. Voisin and A. Péron (Archives de Neurol., May, '92).

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The gastric juice after the attack, when injected into guinea-pigs, causes disturbances not produced by normal gastric juice. This toxic power is slightly increased before the attack and immediately after, and varies according to the duration and intensity of the fit. Agostini (Gaz. degli Osped., No. 38, '96).

In true epilepsy, after a convulsive attack, modifications in the urine invariably found. The nitrogen and phosphates, both alkaline and earthy, but especially the latter, are increased. The toxicity of the urine is diminished.

Perturbations of the general temperature noticed, which is lowered during the convulsive period, the period of stertor, and the subsequent period of sleep. On the patient's awaking it rapidly regains, or even surpasses, the normal. The temperature is occasionally, however, raised, not lowered, during the periods of convulsions, stertor, and sleep. The hypotoxicity of the urine persists between the attacks, even when they are suspended for a year or more. Mairet and Vires (Bull. de l'Acad. de Méd., p. 99, Jan. 26, '97).

It is not uncommon to see subcutaneous facial hæmorrhage in epilepsy when the patient has been in the *status epilepticus*, or has had many seizures in the course of the day. Pierce Clark (Med. Record, Mar. 26, '98).

In atypical cases any one or several of these symptoms may be absent or so slight as to be scarcely noticeable. In

some patients one or more of these symptoms may be replaced by substitutive conditions entirely different. In grand mal the post-convulsive somnolence may be replaced by an outburst of excitement or delirium or by states of altered personal identity in line with the theory of dual consciousness, during which actions both embarrassing and reprehensible may be committed, involving sometimes grave questions of medico-legal responsibility.

In petit mal both motor spasm and unconsciousness are involved in far less degree, as the term indicates. Very often, indeed, the disturbance is of one sphere alone apparently, the attack consisting of a transient loss of consciousness alone, without motor spasm, or of motor spasm unattended with perceptible loss of consciousness.

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Number of cases collected showing the existence of a form of epileptic seizure which manifests itself by attacks of gastralgia. Fichaux (Thèse de Lille, '97).

Nocturnal incontinence in early childhood in connection with epilepsy is much more frequent than is supposed, and may be the sole apparent feature of epileptic attacks that are confined to the nighttime for a long period. Nocturnal epilepsy that consists of an orgasm with no external escape of a discharge, but simply an ejaculation of seminal fluid noticed. Allan McLane Hamilton (N. Y. Med. Jour., Apr. 23, '98).

Not only may the motor spasm occur alone; it may be further limited to one limb or to one set of muscles, or even to a single muscle. Such limited spasms are, however, observed—we have reason to believe—only in the organic epilepsies belonging to the Jacksonian, or so-called cortical, group. In such cases the limb or muscle involved points with localizing significance to the site of the dis-

ease-process in the corresponding centre in the cortex. This statement is true, though of less value, as regards the various forms of sensory and psychical epilepsy. Among the rare clinical forms of atypical epilepsy most of which are of the petit-mal group are *epilepsia procursiva*, *E. nutans*, *E. loquax*, cardiac epilepsy, and migrainous epilepsy. *Epilepsia procursiva* is a form of the disease in which "the attacks consist in a straight or circling run, of a variable distance, which is rarely followed by a fall or course, but by facial congestion" (Hare). The patient may run to the left or right or straight ahead. The act is essentially involuntary, of course, though absolute unconsciousness may not occur. This purposeless run may constitute the entire clinical phenomenon: it may represent the first stage of an ordinary epileptic attack; it may occur as a post-epileptic phenomenon.

Two cases of *epilepsia procursiva* reported. In both cases the "running fits" were the only manifestations of the epilepsy. Hare (Med. News, Nov. 17, '88).

Procrustian epilepsy is peculiar to childhood and youth. It may be present many years before merging into ordinary epilepsy. It is impossible to localize the disease anatomically, but it is not warrantable to assume that a cerebral lesion is the organic cause. It appears to develop especially in persons with marked cerebral lesion, but it is nevertheless probable that it, like all other epilepsies, may occur without demonstrable alteration in the nerve-centres. It is often complicated with moral insanity. La-dame (Inter. klin. Rund., Feb. 3, '89).

In *epilepsia nutans*, a minor form of Jacksonian epilepsy, the motor spasm is limited to the muscles of the neck, causing nodding of the head alone. In *epilepsia loquax* the attack consists in an explosion of speech, the focus of disease being presumably limited to the speech-

centre. In cardiac epilepsy the attacks at first may resemble closely either angina pectoris or simple cardiac syncope. The patient has little more than an aura of præcordial anxiety, usually at night, or when lying down with transient consciousness, but without motor spasm. There is in such cases either a bradycardia or a tachycardia, rarely a normal pulse, usually no organic cardiac disease, but often some arteriosclerosis.

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Heart-epilepsy appears in young subjects chiefly as a result of valvular disease; in the elderly as a result of arteriosclerosis and subsequent changes in heart-muscle. F. Mahnert (*Wiener med. Woch.*, Nos. 33 and 35, '97).

It is at first a petit mal. Gradually, as a rule, the attacks become more severe, and finally may assume the major, or grand mal, type. This fact of transition in these milder forms to the severer forms of the disease is true of all cases as a possibility, although in many patients a petit mal remains such.

Migrainous epilepsy is a form of the disease in which habitual migraine may be either succeeded by true epilepsy of major or minor type or the epilepsy be succeeded by migraine, or the two conditions may alternate in the same patient. In some instances many phenomena of both diseases—if they be really two—may be noted simultaneously. I have seen two such instances.

Pathological relationship of migraine and epilepsy denied. Only one case recalled in which the two affections co-existed. Epileptics are remarkably exempt from headache, and remedies do not act alike on the two diseases: *e.g.*, antipyrine and bromides. Wilks (*Lancet*, Aug. 11, '88).

In studying the peculiarities of attacks in individual examples of the disease it will be found of advantage to

systematize such study under four divisions or stages: the preparoxysmal, the paroxysmal, the post-paroxysmal, and the intraparoxysmal or intervalling period, as it is sometimes called. The preparoxysmal, or pre-epileptic, stage covers the period immediately preceding the attack. By far the most important symptom to be investigated here is the aura, or warning, by which is meant some peculiar and constant subjective sensation or psychical impression realized by the patient as being premonitory of a fit. An aura is present in less than one-half of all cases, but it may be of great value and should always be carefully investigated. The aura may be referable to any of the senses. Flashes of light, sudden blindness, weird and fantastic visions, strange noises, tinnitus, deafness, numbness or tingling or burning or pain in the extremities, disagreeable and indefinite; but constant stomachic sensations—as fullness, oppression, or pain, constriction of the throat or of a limb or of some part of the trunk—are among the auræ which have been noted.

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The "dreary state," or "intellectual aura," is illustrated in the case of a man, 37 years of age, who had been subject to fits since the age of 21 years. Preceding a fit there was usually considerable psychical disturbance which began about twelve hours before the fit and was characterized by strange weird presentiments, quite indefinable, often accompanied by sudden recollections of trifling things that had happened in childhood and loss of memory for things connected with his every-day life of the present. Campbell Thomson (*Practitioner*, Dec., '97).

The aura is an aid sometimes in deciding the etiological diagnosis. A sensation of coldness preceding an attack is said to be, especially if associated with

subnormal temperature, almost diagnostic of cardiac epilepsy. A warning of præcordial anxiety is also suggestive of this type. The aura often constitutes a guide to the location of the cerebral lesion, as, for example, in the patient reported by Brevor and Horsley, in whom an aura of a horrible taste and smell pointed to the uncinate and hippocampal gyri, found to be the site of the causative lesion upon post-mortem examination. The interval between the aura and the attack varies. At times it is exceedingly short; in others the interval is sufficient to permit the patient to prepare for and prevent the attack.

The paroxysmal stages should always, if possible, be studied personally, or through a competent or preferably a trained observer or nurse. The statements of the patient are obviously unreliable. The most important phenomenon to be noted in this stage is the location of the first convulsive movement, or, as it is called, the signal-symptom. This initial motor spasm, close in significance to the aura, is even more valuable at times in pointing toward the cerebral area involved by the lesion. Spasms, always beginning in the right foot, for example, point to the upper left Rolandic cortex, etc. The value of the signal-symptom is greatest the earlier it is recognized. Epilepsy of long standing, even though dependent upon a focal lesion, tends to become general.

The post-paroxysmal period is quite as important for the determination of essential facts as either of the other two and in much the same way. A monoplegia,—or limited sensory loss,—an aphasia, or an acute psychosis may possess an even more positive pathogenesis and localizing significance than the aura, or signal-symptom. The interparoxysmal period is quite interestingly filled

with curious phenomena in many cases. Various states of mental alterations or abnormality, of amnesia, and morbid propensity may appear and may decide entirely the question of prognosis. Evidences of essential degeneracy, manifest in stigmata, are conveniently considered here. Asymmetry or abnormality of development,—especially of the skull,—undue elevation of the palate-roof (Gothic arch), a deficient number of teeth, undue elongation or eversion of the coccyx,—the rudimentary tail of Féré,—are among the large number of stigmata observed.

Extreme frequency of fronto-facial asymmetry in cases of idiopathic epilepsy observed; out of thirty cases only one did not show irregularity of outlines of face and head. Bourneville and Sollier (*Le Progrès Méd.*, Sept. 8, '88).

Diagnosis.—The recognition of epilepsy, in its typical form, is ordinarily a matter of no great difficulty. As, however, convulsions from uræmia, dentition, etc., do not differ materially from epilepsy except in the matter of habitual repetition, it is necessary to consider all the collateral facts in addition to the seizure itself. A history of repeated convulsions of abrupt onset and without immediate assignable cause is, in itself, almost diagnostic. Even with such a history, however, the individual patient should always be given the benefit of a cautious differential examination, which should invariably include a careful urinalysis. Aside from the accidental or incidental convulsions which may accompany other diseases, such as nephritis, diabetes, certain forms of meningitis, etc., there are only four conditions which are likely to confuse the diagnosis: tetanus, malingering, syncope, and hysteria. Tetanus differs from epilepsy in the two facts of retained consciousness

and tonic spasm alone, clonic spasms being absent. The detection of malingering will at times, as in the famous case of Clegg, the "dummy chucker," prove quite difficult. It is seldom the case, however, that a malingerer will learn his part as well as Clegg, and few of them will have the stoicism to withstand the tests of pin-prick, hot iron, ammonia-vapor, etc., which are indicated in suspected cases. Clegg, by the way, was brought to an acknowledgment of malingering by being confronted with the fact that in his spasms he violated a physiological as well as a physical law, in that the thumb was contracted in flexion *outside* instead of *inside* the other fingers.

In simple syncope there is no motor spasm.

Hysteria is really a form of malingering, and the same tests apply. Here, as with other manifestations of hysteria, the disease-picture simulated is nearly always overdone. A strikingly-constant physiological mistake of the hysterical is the reversed of the epileptic order of the convulsive movements, beginning with the clonic instead of the tonic, or mixing them up indiscriminately. If the patient happens to be a woman and of any of the Latin races (and I would add Polish Jews) it is necessary to exclude, with special and elaborate caution, major forms of hysteria. In many forms of minor epilepsy, especially in cases in which the disease manifests itself through the medium of psychical or sensory equivalents, a positive diagnosis is possible only after continued and close observation of the individual patient.

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Prodromal symptoms are frequent in epilepsy, rare in hysteria; the aura is seldom absent in epilepsy, and the accompanying hallucinations often urge the patient to murder, burnings, and

robbery; the aura is much less frequently present in hysteria, and the accompanying hallucinations are less alarming, but are of longer duration. The initial cry in epilepsy is piercing, the patient grows pale, and falls unconscious, possibly wounding herself; the hysterical patient is never entirely unconscious, and does not suffer any injury. The dilatation of the pupil, rigidity, congestion of the face, and salivation are more constant in epilepsy than in hysteria. The tonic and clonic convulsions are much more intense in epilepsy, incontinence of urine and feces is more frequent, and there is usually present complete anæsthesia,—occasionally hyperæsthesia. The pulse during the epileptic seizure is small, scarcely palpable, but slightly changed during the hysterical attack. The termination of the attack is more lytic in epilepsy, more critical in hysteria. Finally, the hysterical is particularly susceptible to suggestion and hypnotism, and their attacks may be, by these measures, controlled for a long time, whereas the influence of these agents over the epileptic is minimal. *Bonjour (Revue Méd. de la Suisse Rom., No. 2, '96).*

Cardiac epilepsy cannot, in its incipency, in some cases, be differentiated from angina pectoris. The association of arteriosclerosis or other evidences of vascular degeneration, common to both conditions, adds to the confusion. Epilepsy occurring only at night may exist for years unrecognized. Sleep-walking, persistent nocturnal enuresis, and other similar phenomena should always suggest an inquiry as to the existence of epilepsy.

In the epileptic psychoses a dream-like, altered condition of consciousness is probable, and not by any means a total or partial amnesia. The most various transition-forms occur between the different forms of so-called acute and chronic epileptic psychoses. Epileptic or epileptoid conditions and psychoses must alike be reckoned as symptoms of cerebral disease. The transitory, dreamy states

are characterized by the rapidly-recurring, apparently orderly, indifferent, and inconspicuous manifestations, and by unusual, unexpected, often violent, acts. There is no epileptic psychosis without epileptic or epileptoid antecedents. Epileptoid conditions are more frequent than is commonly supposed, especially vertiginous attacks. With the lack of epileptic or epileptoid manifestations, all other symptoms, such as amnesia, similarity of the attacks, peculiarities of actions, sensory hallucinations, will serve to make the diagnosis of epilepsy most probable. E. Siemerling (Berliner klin. Woch., Nos. 42, 43, '95).

Syphilitic epilepsy may be recognized from the history of infection, together with a history of the symptoms, which are, with remarkable constancy, premonitory of syphilitic invasion of the brain. Unless the epilepsy develops in early or middle life, without other assignable cause, the first convulsion having been preceded by periodically-recurring headaches of evening onset and nocturnal exacerbation, associated with marked insomnia, or, less often, somnolence, with general malaise, and irritability of temperament, the diagnosis of syphilis, as a source, should be rejected in spite of a history of infection. If this prodromal syndrome be present, it should be strongly entertained in spite of a denial of infection.

Etiology.—Heredity, age, sex, occupation, and the history of previous or co-existing disease, or injury, are all factors demanding investigation in determining the etiology in every case of epilepsy.

Heredity is remarkably common as an etiological factor, especially in idiopathic epilepsy.

In the study of 110 epileptic families, epilepsy was the most frequent form of direct heredity; next to it was mental disturbance, with the well-known signs of degeneracy. Bambart (Jour. de Méd. de Bordeaux, June 17, '88).

Epilepsy appearing after the fortieth

year may be called *epilepsia tarda*. Heredity plays a very important rôle in the etiology. It is milder and less progressive usually than epilepsy occurring in the young, and the mind is less apt to be affected. Mendel (Deutsche med. Woch., Nov. 9, '93).

Heredity is variously estimated as present in from 15 to 50 per cent., Hamilton believing that it exists in one-half of all cases. It should be borne in mind, however, that he included immediate and collateral ancestral phthisis and apoplexy as evidences of heredity, which is not admitted by most clinicians. Epilepsy itself in the parent or grandparent or brother or sister is quite frequent. I have found parental epilepsy alone in 15 out of 77 cases. Insanity, migraine, alcoholism, consanguinity of parents, and major hysteria are among the more common ancestral taints observed. In Gowers's table of 1450 cases heredity appeared in the history of 36.6 per cent. As regards age, epilepsy is peculiarly—though not exclusively—a disease of childhood and early life.

Of Gowers's cases, 422 occurred under the age of 10 years, and 1087 under the age of 19 years.

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Case of idiopathic epilepsy observed developing in the eightieth year of life. Frederick T. Simpson (Jour. of Nerv. and Mental Dis., Jan., '96).

According to the same table females show a somewhat greater predisposition to the disease than males (females, 54.6 per cent.; males, 46.4). This relative difference is really greater than is indicated by these figures, if we take into consideration the greater exposure in males to cranial and other accidents, which are frequent causes of epilepsy. The occupation is often a side-light upon the etiology. Epilepsy in sailors or prostitutes

suggests syphilis; liquor-selling suggests alcoholism; painting and plumbing suggest lead as a cause.

Syphilis may revive an old epileptic tendency or actually cause attacks. Fournier (*Gaz. des Hôp.*, Sept. 13, '88).

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Alcoholism in its acute and chronic form may become an important etiological factor of epilepsy. The nutritive exchange of the cells in an organism saturated with alcohol is impaired. The normal vital activity of the plasmic unit, its inherent ability to effect chemical change, is partly or totally suspended, is paralyzed, if physiologically, and poisoned, if chemically, viewed. Heinrich Stern (*N. Y. Med. News*, Sept. 18, '97).

Certain diseases tend to develop an instability of the nervous system, and thus predispose the subject to the subsequent development of epilepsy.

Procursive epilepsy accompanies organic lesions of the cerebrum. These organic lesions are scleroses, either trophic or hypertrophic, and may attack different parts of the cerebrum, but may exclusively affect the cerebellum. Mairret (*Revue de Méd.*, Feb., '89).

Epidemic and sporadic cerebro-spinal meningitis, insolation, scarlet fever, typhoid fever, and other kindred diseases, if attended with prolonged high temperature or toxæmia, may lead to the development of epilepsy, the relationship being apparently one of cause and effect.

In many so-called idiopathic cases a history of an acute infectious disease is obtained, and in the course of such disease microbic infection of the brain and cord occurs, forming inflammatory foci, which undergo complete absorption or cicatrization. The cicatrices (in syphilitic and traumatic cases also) are the immediate sources of epileptic attacks. Lemoine (*Le Progrès Méd.*, Apr. 21, '88).

In epilepsy consecutive to infectious diseases convulsive attacks are in close

relation to the uræmic accessions and closely resemble the cortical phenomena of expulsion of toxic matters contained in the blood, and are very probably due to an accumulation in the blood of extractive matters formed in large quantities in a patient whose nutrition has become perverted. Lemoine (*Gaz. Méd. de Paris*, Sept. 14, '89).

Disease of the heart or blood-vessels interfering with the circulation in the brain and its nutrition is properly regarded, we think, as a sufficient explanation of the etiology in certain cases of cardiac and so-called senile epilepsy, and perhaps in other obscure cases. With regard to the organic and toxic epilepsies, the etiology and pathology is that of the primary organic disease, the epilepsy in such cases appearing only as a single, though sometimes the most important, symptom. Any source or irritation within the cranial cavity, whether chemical or mechanical, may—though it by no means must—induce a convulsion.

Of interest in connection with the subject of general predisposition to epilepsy are the statements of Peterson that the disease bears a ratio to the general population in this country of 1 to 500, and the further statement by Gray that a considerable majority of all epileptics have dark hair and eyes.

Reflex epilepsy, the existence of which is somewhat widely questioned, quite probably occurs, but in comparatively rare instances. Among the innumerable conditions of peripheral disease which have been noted as bearing an apparently causative relationship to the development of epilepsy are phimosis, adherent prepuce or clitoris, stenosis of the uterine os, nerve-cicatrices or surgical disease of the limbs or joints implicating nerve-trunks, carious teeth, eye-strain (esophoria, exophoria), obstructive disease of the nasal passages, aural disease, etc., etc.

There is much to support the reflex theory in both experimental and clinical experience, although, as with many other phases of the subject, it is, as yet, no more than a theory.

Irritation of the dental nerves by diseases or misplaced teeth may be a cause of epilepsy. Brubaker (*Jour. of Nerv. and Mental Dis.*, Feb., '88).

Interesting case of reflex epilepsy observed in which the attacks occurred once or twice a week, accidentally and completely cured by the removal of a shoe-button forming the nucleus of a large rhinolith in the left cavity. E. H. Griffin (*Med. Rec.*, July 21, '88).

Two cases of epilepsy caused by nasal disease showed rapid improvement upon treatment of the nasal disorder. E. G. A. Ten Siethoff (*Journal of Laryn.*, June, '95).

A patient, aged 20, was physically well developed, except that the uterus was rudimentary; had menstruated once; for four years had been subject to epileptic convulsions of monthly type; was becoming imbecile. As every mode of treatment had proved futile, celiotomy and removal of ovaries was advised. The ovaries were rather large, white and glistening in appearance, and in cystic degeneration, probably of prenatal origin. Four months after operation her mental condition was normal and she had had no more convulsions. E. W. Jenks (*Med. Age*, Dec. 10, '95).

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A large percentage of cases may be traceable to injuries in early life. W. A. Dixon (*Med. Record*, May 30, '96).

Case of a young man complaining of severe pain in the head. Since childhood has had a chronic discharge from the right ear, and although he had never had any fits stated that he occasionally felt giddy and at the same time experienced peculiar sensations of smell which he could not accurately describe except that they were very unpleasant. A few hours after admission to hospital he became delirious and died suddenly, and at the necropsy he was found to have an abscess situated in the anterior

part of the right temporo-sphenoidal lobe. In more than one case a lesion in this region has given rise to an olfactory aura similar to that here described. Campbell Thomson (*Practitioner*, Dec., '97).

There is a close and constant connection between the excretion of urea and epilepsy. Every attack is preceded, twenty-four to forty-eight hours, by a diminution in the amount of urea excreted, and as long as an epileptic excretes 0.6 to 0.8 urea during the day there is no danger of an attack, but, if the excretion falls to 0.45 or 0.35, one is imminent. Epilepsy may, therefore, depend upon anomalies in the metabolism. Lithium carbonicum, 15 grains three times a day, produces a decidedly favorable effect. N. Krainsky (*Jour. Amer. Med. Assoc.*, Apr. 16, '98).

Paraxanthin is an all-important factor in the production of true migraine, also in one form of epilepsy. Paraxanthin is found in great excess in urine secreted during attacks in a certain class of epileptics. Paraxanthin not found in the urine of patients with focal or reflex (hereditary) epilepsy, and presence of an excess of paraxanthin in the urine of epileptics considered an essential diagnostic point in ascertaining the variety of epilepsy from which the patient is suffering. Rachford (*Amer. Jour. of the Med. Sci.*, Apr., '98).

Increased quantity of the cerebrospinal fluid is an important element in the production of epilepsy. What the exact condition may be that permits of such marked fluctuation as occurs in the quantity of this fluid in epilepsy is uncertain. Possibly a toxic element is responsible; more likely a defect in the activity of the lymphatic or excretory functions. William House (*Buffalo Med. Jour.*, June, '98).

In every case of genuine idiopathic epilepsy in childhood not the outgrowth of a family neurosis syphilitic inheritance is to be suspected. Joseph Pettee Cobb (*Clinique*, May 15, '98).

Pathology.—The true pathology of idiopathic epilepsy is as yet an unwritten chapter in the history of the disease. We

have reason to believe that the essential location of the conditions causative of the explosions which constitute epilepsy is in some part of the brain-cortex. The theory of interference with inhibition through irritation of the higher cells of the cortex, a theory elaborated *in extenso* by Hughlings-Jackson, is generally accepted, but not yet proved. This theory is not inconsistent with the experimental conclusions of Nothnagel tending to establish the fact of the existence of a lower convulsive centre in the floor of the fourth ventricle (pons).

The study of the morbid anatomy of epilepsy has so far been equally inconclusive. The abnormal conditions noted have varied with different observers even with the vastly-improved laboratory-technique employed within recent years. The tuberous or hypertrophic sclerosis, found chiefly upon the convexity of the convolutions, by Barthez and Rilliet; the "gliosis" invading the normal cellular tissue, as described by Chaslin; the vacuolation of cortical cells with increase of spider-cells, found by Bevan Lewis; the hyperplasia of neuroglial tissue, with reduction in size and deformity of the cells, as observed by von Geison; these are all interesting and perhaps important; but numerous and insurmountable objections exist in each instance to their final acceptance.

There is a group of epileptics characterized by attacks of grand mal with occasional mania, all prone to sudden death. Those observed by the author were all adults, and the pathological findings were a uniform picture. The thymus was persistent, and apparently functionally active as at birth. The solitary and agminated lymph-follicles of the whole intestinal tract were hypertrophied and stood out as little protuberances on the otherwise-normal intestinal mucous membrane. Similar follicles were found on the tongue. The lumen

of the arch of the aorta was noticeably narrowed. A. P. Ohlmacher (Bull. of Ohio Hosp. for Epileptics at Gallipolis, vol. i, No. 1).

The principal seat of the disturbance of a general or idiopathic fit is the cerebral hemispheres, and especially their cortical mantle; the condition of the cortex during the attack is one of congestion, and not anæmia; and, in all probability, this portion of the encephalon is actually the place of origin of the disturbance. Victor Horsley (Brit. Med. Jour., Apr. 2, '92).

Epileptic attacks may be explained by cortical irritation alone, but when a seizure becomes generalized it indicates that the bulb and cord are equally involved. Venous stasis, with acute œdema due to a vasomotor process, explains the pathogenesis of the attack. Hohne (Nordiskt Med. Arkiv, No. 15, '93).

Cerebral anæmia positively predisposes to cerebral seizures, while hyperæmia does not. Gutnikow (Bull. de la Soc. de Méd. Mentale de Belgique, Mar., '92).

Sclerosis of the brain, at least its most evident forms, is due to proliferation of the neuroglia, and so-called true epilepsy is often due to neuroglial proliferation, probably occurring from some developmental disturbance, which is aided by heredity, and not of inflammatory causation. Chaslin (Deut. med.-Zeit., Mar. 18, '89).

Idiopathic epilepsy is nearly always of infectious origin, its cause being exterior to the subject and originating after conception. Pierre Marie (La Semaine Méd., July 13, '92).

In the brains of 26 epileptics there was always a distinct hypertrophy of the cortical neuroglial fibres lying between the pia mater and the outermost layer of tangential nerve-fibres. The glia-fibres were increased in number and thickness, had a tendency to form bands running in a parallel direction, and often formed "whorls" around the entering vessels. This change was spread over the brain-mantle generally, but there were places in which it could not be observed. The intensity of this gliosis was not proportional to the duration of

the disease. Bleuler (Münch. med. Woch., No. 33, '95).

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Epilepsy is the dynamical expression of an inhibitory insufficiency, not indicative of an overproduction of nerve-energy, nor due to a molecular irritability *per se*. The cause of the inhibitory insufficiency is to be sought in the end-bulbs of the collateral processes of various cortical neurons. This defect consists most probably in a structural incompleteness, or a numerical deficiency, in the collaterals referred to. These defective collaterals may favor recurrences of convulsions in two ways:—

1. By impairing connection with the neuron (inhibitory storage).
2. By increased resistance to overflow currents, causing a temporary overcharge of motor axis-cylinders. Langdon (Jour. Nerv. and Ment. Dis., Sept., '96).

Our knowledge as to the pathogeny of epilepsy is scarcely less obscure and no more satisfactory. Anæmia or hyperæmia in extreme degree may, either of them, excite a convulsion. This is a fact of experimental demonstration as well as of common clinical experience. Mechanical irritation—as from trauma, neoplasm, or foreign bodies—is an agency capable of inducing convulsive attacks, as is well known. Transmitted irritation from the periphery, through the medium of some local condition of disease—as, for example, an injured nerve—may excite a convulsive explosion of the corresponding cortical centre. Carious teeth, stenosis of the uterine os, volvulus of the intestine, adherent prepuce, and many other conditions of local disease may, through the medium of transmitted irritation along the afferent nerve-trunks, provoke an explosion of the related cells of the cortex. Such cases constitute the much-questioned, but undeniably existent, class of reflex epilepsies. Finally, we have as a factor

in the pathogenesis of epilepsy certain states of toxæmia, some of them autogenous in origin, others depending upon the introduction from external sources of poisons with a relative affinity for the cortex.

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Facts point rather to a toxæmic origin than to any pathological change in the brain or spinal cord. Percy Bryant (State Hospital Bull., Oct., '96; Jour. of Mental Science, July, '97).

The attack is due to an anæmia of the cerebral cortex, brought on by an arterial constriction due to either hyperirritability of vasomotor centres or of the cortical motor centres, or (and this is true in a majority of the cases) of both. Such hyperirritability may be congenital or acquired, and the immediate cause acting on these centres is a poison or ptomaine generated within the body of the patient himself. A. M. Bleile (Med. Times, July, '98).

The toxic epilepsies—those which are as yet positively determinable as such—are not numerous. There is reason to believe, however, that much more information remains to be gained as to the true pathogeny of epilepsy from the crucible and the chemist than from the scalpel and the anatomist.

Prognosis.—The prognosis in epilepsy may be said to be progressively bad in a direct ratio with the number of attacks or the duration of the disease in the patient affected. If of long standing, the prognosis is bad, regardless of the cause. One convulsion, even though it be accidental, invites another, and, if repeated a few times, the convulsive habit is established and is curable only in rare instances. Organic epilepsy dependent upon focal disease of even circumscribed limits is no exception to this rule, unless recognized promptly and treated properly by surgical procedure at once. Epilepsy due to syphilis, if promptly treated,

can be cured; if treatment is delayed, it quickly becomes as intractable as any other form of the disease. This is true also of the toxic and reflex varieties. The element of heredity is of sinister significance in proportion to the intensity with which it may appear in the individual family history. The age of onset is of importance in prognosis, both as regards the curability of the disease and the development of serious complications. In epilepsy beginning in early childhood the tendency to the development of *status epilepticus*, a condition dangerous to life, is increased. I have seen this condition in seven cases, and in every one of them the disease began before the age of ten years. The development of dementia is more probable the earlier the onset of epilepsy. Mania as a complication is more likely to be found in cases developing at puberty or later in life. Epilepsy developing without assignable cause at middle age (the *épilepsie tardive* of Forel) seems more amenable to treatment and the prognosis is rather better. In one such case, however, observed by the writer, the disease having developed after the age of thirty, there being a history of parental syphilis, the patient died in an epileptic attack, the disease having persisted for several years. Death from or during an epileptic seizure is not uncommon. The *status epilepticus* is especially dangerous to life. Paralysis of the cardiac or respiratory centre is usually the immediate cause. Mechanical asphyxia is not infrequent. No reputable life-insurance company will accept an applicant known to be affected with epilepsy.

What constitutes a cure in epilepsy? Freedom from attacks for one, two, five, or even ten years cannot be considered as final evidence of cure, since it has been the personal experience of every neurolo-

gist to note recurrences after such intervals of remission. I myself have known a patient to exhibit a spontaneous remission for twenty-three years, the attack recurring without determinable new cause, and in exactly the same form, clinically, as at first. G. M. Hammond takes the position that relief from attacks for one or two years constitutes a cure, subsequent recurrences to be considered as new attacks. The objection to this teaching—there are many—is that, in some patients in whom the disease lasts through life, the attacks may be reported by intervals of a year or longer throughout the disease. Personally, I do not believe in the radical cure of epilepsy, if the disease has persisted for more than two years, except, perhaps, under an ideal environment attainable only in specially equipped institutions.

Of importance in estimating the prognosis is the presence or absence of stigmata of degeneration. Epileptics exhibiting cranial asymmetry or anomalies of development or well-marked intellectual or moral perversions are notoriously patients admitting only the most pessimistic prognosis. Well-marked periodicity in the occurrence of attacks in a subject constitutes a factor somewhat favorably modifying the prognosis.

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A cautious prognosis should be made in any case of epilepsy in which the sleep-stage is habitually omitted, and in which the patient is constantly afflicted with severe frontal headache. L. Pierce Clark (N. Y. Med. Jour., June 19, '97).

Medical Treatment.—The ideal treatment of idiopathic epilepsy is, in my opinion, attainable practically only through institution environment, organized on the colony-plan, or as it is in Ohio or at Sonyea, New York. The

necessary regulation of the habits, diet, clothing, exercise, sleep, and the employment of various adjuncts, direct and indirect, such as hydrotherapy and gymnastics, and appropriate culture of the mind and morals, can be accomplished systematically only in an institution established and conducted for such a purpose.

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The experience of the epileptic colony at Chalfont, St. Peters, Bucks, during the four years of its existence, pointed to the fact that the younger the epileptic and the sooner he was admitted after the onset of the seizures, the more satisfactory the result of the general management and *régime* adopted. The principles directing the management are simple: (a) removal of the epileptic from town to country; (b) regular employment under direction; (c) the maintenance of a well-ordered and regular mode of life, with avoidance of excitement and abstinence from alcoholic liquors; (d) abundance of good nourishment of a simple nature. The general result was that the fits in the majority of cases diminished both in number and severity, in some cases to quite an extraordinary extent; the physical health materially improved, while the mental condition in all but a few cases showed obvious improvement. Aldren Turner (*Brit. Med. Jour.*, Apr. 23, '98).

Where this is impossible, some such general plan as the following is advisable: Epileptics should be given some employment always, preferably physical and congenial and out-of-doors.

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An epileptic child should lead a simple, regular life, as much as possible out-of-doors, away from the excitement of a great city or from association with many children. Editorial (*Pediatrics*, May 1, '98).

The diet should be regulated to two meals a day. Plain, wholesome food

simply and properly cooked should be given liberally, but not in excess. Epileptics should be trained to eat slowly and to thoroughly masticate all food. Very little fluid should be permitted with meals. No special constant diet table is either necessary or advisable, except in individual patients in whom some special indication exists. The two meals should be given at 10 A.M. and 5 P.M. The patient should be required to drink water freely and at regular intervals between meals—as much as three or four pints should be taken daily. The living rooms should be light and never overheated or contaminated by impure air. Epileptics should be carefully protected from exposure to extremes of temperature. Tonic baths at proper intervals, keeping the skin active, and assisting in general nutrition are valuable, but there is no special system of hydrotherapy which will cure epilepsy.

The best method for a fairly robust person consists in giving simultaneously the rain-shower and the jet. The person standing in the shower receives a jet of water on the posterior surface of the body for fifteen seconds; then the jet alone for fifteen seconds; finally, the jet alone on the anterior surface of the body for thirty seconds. Dana (*Dietetic Gaz.*, Dec., 91).

As regards the drug treatment, we are still dependent upon the bromides. Animal extracts, antitoxins, and various other sensational specifics, including hypnotism, have been vaunted in recent years, but have failed to stand the tests of trial fairly made. (See ANIMAL EXTRACTS.)

The use of Merck's ovarin tablet, beginning with 1 for the first day and increasing to 10 per day, in epilepsy due to disturbed functions of the genital apparatus, may be productive of excellent results. Karl Bodon (*Deut. med. Woch.*, 22, p. 727).

The coal-tar derivatives—antipyrine, phenacetin, lactophenin, etc.—have also had their day, although their use is not altogether without benefit temporarily under certain circumstances.

Antipyrine advocated in epileptics whose attacks are influenced by menstruation. A daily dose of 31 grains ordinarily suffices, and it is best to give it only during the periods mentioned. Lemoine (*Jour. de Méd., de Chir., et de Pharm.*, Dec. 20, '88).

Antipyrine tried in nine cases of epilepsy with no satisfactory result. Its continued use produced cyanosis in every case. Borosnyoi (*Centralb. f. die Gesamte Ther.*, Mar., '88).

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Case of epilepsy successfully treated by regulating the diet and giving antipyrine and sodium salicylate. J. Howe Adams (*Southern Practitioner*, Feb., '98).

Ethylene-bromide, amylene-hydrate, sulphonah, trional, curare, and solanum Cariolensis are a few among the hundreds of new remedies recommended which have proved of only slight value or useless altogether, or, as with amylene-hydrate and curare, worse than useless. Borax, preferably in the form of the biborate of soda, is an exception in that it rarely does seem to possess a positive value, especially in nocturnal epilepsy. The dose is from 15 to 60 grains once, twice, or three times daily. Very much larger doses have been given and have been well borne. In this variety of epilepsy, too, the hypnotics—sulphonah, trional, chloralamid, and urethan—have a useful purpose as occasional temporary substitutes for the bromides.

Substitution of atropine recommended in those cases where bromide cannot be borne, or where it proves inefficacious. Moeli (*Archives de Neurol.*, Feb., '95).

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Trional may often be used as an efficient substitute for bromides. No ill results seen from many weeks of its continuous use. It is at times well to give bromides in the day-time and trional at night. Mitchell (*University Med. Magazine*, Mar., '96).

In giving the bromides certain general facts should be recognized. The potassium salt is the most effective.

All bromide salts should be specially investigated as to purity of manufacture. Every dose of bromide should be given well diluted. The dose is inconstant necessarily and varies with the type and intensity of the disease in each patient. In an ordinary case, with attacks of moderate severity occurring four or five times a month, or less often, the patient should begin with 20-grain doses twice daily. This may be increased or diminished according to the effect. An insufficient dosage is practically useless; on the other hand, no unnecessary excess of the drug should be continuously introduced into the system, since bromism, if prolonged, induces a condition scarcely less deplorable than epilepsy.

Sulphonah and trional will prove useful in a considerable number of the epileptic cases as adjuncts to the bromides, with which they can be profitably alternated. Frost (*State Hosp. Bull.*, Oct., '97).

In both symptomatic and idiopathic epilepsy the systematic use of bromides is practically the only treatment. A cure can be obtained only in an exceedingly small number of cases. The existence of organic heart or brain disease increases the susceptibility to the drug. It should be given largely diluted, and it should also be administered with reference to the time when the seizures most commonly occur, and the dose increased before any unusual strain, or in young patients at the approach of puberty. After the patient has been three years

without any manifestation of the disease, it is safe to begin to diminish the dose.

Epilepsy is the only disease in the treatment of which we are justified in deliberately producing a degree of bromism. Seguin (*N. Y. Med. Jour.*, Mar. 29; Apr. 5, 26; May 31, '90).

Bromides proved to be the most efficient agents in controlling attacks. Finlay (*Glasgow Med. Jour.*, Sept., '88).

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Strontium bromide is far less apt to produce acne, mental depression, and gastric disturbance than the corresponding salts of potassium. Antipyrine, in doses of 10 or 15 grains a day, can be given with ammonium or strontium bromide for several months without ill effects. Editorial (*University Med. Mag.*, May, '97).

If the attacks occur at more or less regular intervals, as at the menstrual epoch in women, such periods of attack should be anticipated by temporarily-increased doses. Gowers's plan is quite effective in some cases, though bordering on the heroic. He gives one full dose of potassium bromide in the morning after breakfast in half a pint of water, beginning with 2 drachms every second morning, increased to 3 drachms every third morning, and 4 or more drachms (an ounce sometimes) every fifth day. The dose and order of interval are then reversed and the treatment is continued in this way for six weeks; small doses are then given for a year or more.

Potassium bromide seems to be curiously limited in its power for good in the treatment of epilepsy. Occasionally after having been effective for weeks or months or even years, its effectiveness will, without assignable cause, cease. This is true not only of potassium bromide, but of nearly, if not every, other drug useful in epilepsy. Some other salt of bromide or several of them in combination (sodium, strontium, ammonium,

lithium, are valuable in the order mentioned) or one or two of the bromides in solution with antipyrine or in combination with phenacetin may be advantageously substituted for the single salt.

The good effects of Bechterew's preparation are due to the bromide, and not to the adonis or codeine. The mixture is better borne than simple bromide. Guiccardi (*Brit. Med. Jour.*; *Epitome*, Par. 394, Nov. 16, '95).

Bechterew's method tried in ten cases of epilepsy with diminution of the fits both in intensity and duration in each case. Lui (*Brit. Med. Jour.*; *Epitome*, Par. 394, Nov. 16, '95).

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The addition of codeine to bromide appears a bad one. It is certainly the cause of the constipation and probably also of the somnolence observed. The effects of the mixture are the same as those of bromide alone. Bromism is not prevented. The only effects obtained were on the fits. The mental condition of the patients was not at all modified. Even with the adonis neither the hebetude nor the epileptic impulses were avoided. Taty (*Lyon Méd.*, Dec. 29, '95; Jan. 5, 12, '96).

Of 8 cases of epilepsy treated for a period of six weeks by Bechterew treatment, in 4 cases there was complete suspension of the fits, in 3 other cases the fits were replaced by infrequent attacks of vertigo, and in the last case there were four attacks of vertigo and two convulsions. The results were due to the combination of drugs and not to the bromide alone. De Cesare (*Rif. Med.*, Aug. 13, '97).

Case of boy, 10 years old, observed, who had suffered severely with epilepsy for two years. He had from fifteen to twenty fits a day, his mind was notably enfeebled, and there was muscular paresis. He was treated with Bechterew's preparation:—

R Infusion of adonis, 2700 grains.

Codeine, 6 grains.

Potassium bromide, 60 grains.—M.

He took from 5 to 7 tablespoonfuls daily at first, and in a few weeks the

amount of adonis was doubled. The attacks diminished in number and severity and finally ceased altogether. His mental and bodily condition became normal again. Tekoutief (*Revue Neurol.*; *Jour. de Méd. de Paris*, Feb. 6, '98).

Sometimes the addition of one of the motor depressants—as hyoscyamus, conium, belladonna, or their alkaloids—is quite as effective, at least temporarily. As a matter of further curious interest it has been proved by experience that in such cases a change to almost any new drug will result in temporary improvement: a fact which explains, in part at least, the almost limitless pharmacopœia of the disease.

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Withdrawal of the bromides in cases of epilepsy long under bromide treatment is generally followed by improvement of the patient. At times this gain is startling. F. Peterson (*N. Y. Med. Jour.*, No. 914, p. 738, '96).

The use of opium reintroduced recently by Flechsig is deserving of mention and a limited commendation. Flechsig's method consists in the daily administration of opium in the form of the solid extract in doses gradually increased up to several grains (12 to 15) daily, five or six weeks usually being required. Treatment by bromide is then substituted for the opium. This treatment is of distinct benefit in old long-standing idiopathic epilepsies which have not been benefited by the bromides. It is contra-indicated in recent epilepsies and in the organic cases.

Treatment of epilepsy by the bromo-opiate method consists in the administration in the first instance, commencing with doses of $\frac{5}{16}$ grain *pro die*, of powdered opium or of its extract; this dose is distributed over the day. The quantity of opium is then increased by $\frac{1}{16}$ grain each day until a maximum of 4

or 5 grains is taken each day. At the end of six weeks the opium treatment is completely suppressed, and the bromide administration is then begun. This is given in large doses, 105 grains *pro die*, and is continued for at least two months. The contra-indications to this treatment are: the *status epilepticus*, plethora, and the existence of cerebral focal lesions. Its employment is indicated only when the usual bromide treatment fails. Flechsig (*Revue de Théor.*, Nov. 15, '94).

Literature of '96-'97-'98.

The Flechsig method of treatment is of but little value in chronic cases of epilepsy in which dementia has taken place to any marked extent. Clark (*Amer. Medico-Surg. Bull.*, July 25, '96).

Four remedies are deserving of special mention in connection with special forms of epilepsy for the relief of which they seem especially efficacious: nitrite of amyl and monobromated camphor in cases of petit mal, duboisine in hysterio-epilepsy, and the hydrobromate of coniine in the *status epilepticus*. Nitrite of amyl also possesses value as a drug which, if used promptly in cases preceded by an aura, will often prevent the further development of the attack. Chloroform by inhalations is at times temporarily useful in controlling the *status epilepticus*. I have found the use of cardiac tonics of positive value in combination with the bromides in what is known as cardiac epilepsy. The condition of the heart and pulse is the guide to the selection of the adjuvant drug.

To a certain extent, though far more limited than one would suppose from *a priori* reasoning, the etiology affords a basis for treatment. Antisymphilitic treatment should be at least given an energetic trial, as epilepsy is due primarily to syphilis. Such patients, however, as a matter of fact, are not often cured by this means, and, as a further

fact of interest, it will be found that such patients do not bear well energetic specific treatment. Various toxic agencies or conditions of visceral disease, standing in a presumably causative relationship, should be treated, of course, but cure of the toxæmia or the visceral disease very rarely results in cure of the epilepsy.

Surgical Treatment.—The surgical treatment of epilepsy is limited to those cases recognizable positively as dependent upon an organic lesion of limited extent and surgically accessible, the location of the explosive focus being determinable at least approximately from the symptoms.

An operation is only admissible when the surgeon has good ground for expecting a palpable and removable cortical lesion. Such a condition may be confidently looked for in those cases in which the spasms commence, as after cortical stimulation in animals, and gradually progress and become general, each successive attack occurring in the same order. V. Bergmann (*Die Chirurgische Behandlung von Hirnkrankheiten*, '88).

Case trephined for traumatic paralysis. The operation was followed by a slight improvement, but soon after epilepsy developed. Trephining was repeated at the former site of operation, and since then both the epilepsy and paralysis disappeared. Fischer (*Deut. med. Woch.*, May 10, '88).

Trephining in traumatic epilepsy is of doubtful value, because often a trauma is received, following which there are certain symptoms, when the patient becomes healthy, remains so perhaps for three years, when suddenly attacks again appear, from which it is argued that something has occurred in the cicatrix which is evidenced at a later period, perhaps a cyst forming from a hæmatoma. Billroth (*Wiener klin. Woch.*, Jan. 31, '89).

The uncertainty of success after trephining is often due to two causes: First, it is very difficult to determine the direction in which the force of a

trauma will travel through the cerebral contents; so that an occipital trauma does not necessarily mean lesion of the occipital intracranial contents. Secondly, a lesion of the cortex may cause one-sided convulsions, but the extension of the convulsion to the other side does not necessarily denote an extension of the lesion to this other side, but rather an irradiation of nervous impulses; and this irradiation more probably travels from subcortical centres, not through the corpus callosum. Minot (*Wiener klin. Woch.*, Jan. 31, '89).

In case of traumatic or organic lesion an operation should be done as early as possible, in the hope of preventing secondary sclerosis. Sachs (*N. Y. Med. Jour.*, Oct. 31, '91).

In operating for epilepsy, it is advisable to remove a larger piece of the skull than is necessary for the removal of the affected centre in the cortex. Manteuffel (*St. Petersburg med. Woch.*, Feb. 10, '94).

A cure cannot be expected from surgical treatment except in those forms of epilepsy due to a lesion of the cortical motor centres. Extirpation of apparently healthy portions of the brain, but which are suspected to be the origin of the epileptic seizures, approved. Extirpation is only indicated in cases in which a distinct lesion, such as a cyst, is present. Von Bergmann (*Inter. klin. Rund.*, June 23, '95).

Literature of '96-'97-'98.

1. Surgical interference is advisable in those cases of partial epilepsy in which not more than one, or at the utmost two, years have elapsed since the traumatic injury or the beginning of the disease which has given rise to the convulsive seizures.

2. In cases of depression or other injury of the skull, surgical interference is warranted, even though a number of years have elapsed; but the prospect of recovery is brighter the shorter the period of time since the injury.

3. Simple trephining may prove sufficient in a number of cases, and particularly in those in which there is an injury to the skull or in which a cystic

condition is the main cause of the epilepsy.

4. Excision of cortical tissue is advisable if the epilepsy has lasted but a short time and if the symptoms point to a strictly circumscribed focus of disease.

5. Since such cortical lesions are often of a microscopical character, excision should be practiced, even if the tissue appear to be perfectly normal at the time of operation; but the greatest caution should be exercised in order to make sure that the proper area is removed.

6. Surgical interference for the cure of epilepsy associated with infantile cerebral palsies may be attempted, particularly if too long an interval has not elapsed since the beginning of the palsy.

7. In cases of epilepsy of long standing, in which there is in all probability a wide-spread degeneration of the association-fibres, every surgical procedure is useless. Sachs and Gerster (*Amer. Jour. Med. Sci.*, Oct., '96).

Only good witnessed from an operation in cases of distinctly-traumatic origin, particularly in those in which the injury involved motor areas near the fissure of Rolando. Future improvements will be mainly in the technique of the operation and in more extensive removal of bone. Chiene (*Edinburgh Med. Jour.*, '94; *Lancet*, Jan. 11, '96).

Removal of the discharging lesion in cortical and Jacksonian epilepsy can only be regarded as palliative, the operative scar becoming a new source of irritation. The earlier the operation is done after the disease becomes fully established, the longer will the immunity last. Operation is not so dangerous in competent hands as to forbid our urging trephining in this class of epilepsies, especially when done early. Removal of the discharging lesion is imperatively demanded as a life-saving measure in those rare cases where the intervals between the fits are so short that the paroxysms are practically continuous. In all cases it is an error to permit the early resumption of work, particularly manual labor. Operation removes only one of the factors productive of epilepsy; hence the necessity of careful avoidance

of everything which can, either through the mind or body, excite sudden and severe acute cerebral congestion, undue or prolonged mental strain, or constant congestion of the nervous centres. Nancrede (*Annals of Surg.*, Aug., '96).

As in many cases of traumatic Jacksonian epilepsy, cure may be effected by removal of the injured portion of the skull or of degenerated and adherent meningeal structure; extirpation of the affected motor centre is not indicated until after failure of the former operation. Braun (*Centralb. f. Chir.*, No. 44, '97).

For operation, the surgeon is more apt to choose the surgical indications, while the neurologist prefers the symptomatic indication.

Operation is indicated in all cases of (Jacksonian) epilepsy; in all cases where the epilepsy, be it general or partial, has followed and is apparently caused by a depression of the skull, the result of a traumatism. In many cases where a severe head-injury—even though there be external evidence—has been followed by a partial epilepsy, and where the "signal-symptom" indicates a definite area in the brain. A. J. McCosh (*Amer. Jour. Med. Sci.*, May, '98).

Statistics prove that operative measures should only be employed in traumatic cases in which there are localizing features. J. C. Oliver (*Canada Lancet*, July, '98).

To the above class of cases may be added that small number included in the etiological variety known as reflex epilepsies. In organic epilepsies the results of surgical treatment depend upon the accuracy and promptness of diagnosis, including localization chiefly, and secondarily upon the promptness with which surgical interference is adopted, and the personal skill and surgical judgment of the operator. Shock and hæmorrhage are practically the only immediate sources of danger, asepsis having eliminated other surgical complications. Both shock and hæmorrhage are avoidable or can at least be

reduced to a minimum which does not endanger life. Wyeth's method of accomplishing this result in intracranial operations by dividing the operation of entrance into two or more surgical *séances* upon succeeding days is eminently satisfactory. So safe, indeed, is this method, as to have rendered perfectly legitimate surgical entrance of the skull for purely exploratory purposes. The technique of the operative procedure varies with each case appropriate for operation, as well as in accordance with the surgical peculiarities of the operator. There is a growing pessimism representing the return-swing of the optimistic pendulum of ten years ago with regard to the value in results of surgical treatment for organic epilepsy. Von Bergmann and McCosh, among recent writers, unite in a demand for greater conservatism. Mason, quoted by Gray, tabulates 44 cases treated surgically, with two recoveries, or about $4\frac{1}{2}$ per cent. This table is capable of another interpretation, however, which is decidedly more favorable from the fact that in more than half the cases in which the time of observation after operation is said to have been "insufficient to confirm the claim of cure," further lapse of time may serve to establish the claim at least in some of these cases.

Literature of '96-'97-'98.

Reports of seventy operations for epilepsy collected more or less at random from current literature, of which, at the expiration of three years or longer, 4.03 per cent. were cured. E. G. Mason (Med. News, Mar. 21, '96).

Analysis of 70 operative cases of epilepsy. Conclusions as regards prognosis: (a) A certain small percentage of the cases will be cured. (b) A certain larger percentage will be improved. (c) An even larger percentage will not be improved at all. (d) An operation upon almost any case will produce a tempo-

rary cessation of fits. Mason (Med. News, Mar. 21, '96).

Almost all cases of epilepsy which come within the etiological subtype "reflex" demand surgical measures of relief, the removal of the peripheral cause requiring, in most instances, the knife. Phimosi, cervical stenosis, carious teeth, nerve-cicatrices, diseases of the bones, eye-strain, and ovarian disease are all conditions for which the knife or other surgical or mechanical agents are indicated.

Literature of '96-'97-'98.

Castration performed in twenty-two cases, twenty of them in males, with favorable results. Everett Flood (Med. Record, May 23, '96).

Case of primary dysmenorrhœa with epilepsy, in a girl 17 years of age, who was cured after dilatation of the cervix uteri. Braithwaite (Lancet, July 31, '97).

In all cases of epilepsy, when such conditions or any one of them exists, either coincidentally, alone, or as the presumable cause, they should be appropriately relieved. It will not always, nor indeed often, cure epilepsy; but such conditions undoubtedly aggravate the epileptic tendency, and should be eliminated. I have never yet seen a case of epilepsy cured or even benefited permanently by operations upon the eye-muscles or by removal of the ovaries, and I have seen scores of patients upon whom such operations have been done.

The performance of normal ovariectomy for epilepsy is to be regarded as hardly better than malpractice. Lusk (Boston Med. and Surg. Jour., Oct. 15, '91).

Such operations should be done, though with discrimination and always with the frank acknowledgment to the patient of the uncertainty of results.

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EPISPADIAS. See PENIS, DISEASES OF.

EPISTAXIS.—Gr., *ἐπί*, upon, and *στάζω*, I drop.

Definition.—Epistaxis signifies bleeding from the anterior or posterior nasal cavities of traumatic or idiopathic origin.

Symptoms.—The symptomatology of epistaxis other than the blood-flow is somewhat modified by the nature of the exciting cause. In epistaxis due to traumatism the blood flows freely in most cases from one side; the hæmorrhage usually ceases of its own accord, and is not of long duration. In most of the other forms of epistaxis the blood trickles by drops, which follow one another in more or less rapid succession. In nose-bleed occurring as a result of cerebral congestion, premonitory symptoms, such as headache, tinnitus aurium, injection of the conjunctiva, etc., are usually experienced; but these are much improved or disappear altogether as soon as a certain amount of blood has been lost. In persons subject to hæmophilia, the attacks may occur at any time, the least exertion serving sometimes to bring on a severe epistaxis. When the condition is due to vicarious menstruation, it usually presents itself about the time the latter should begin, with intermittent recurrences during the usual duration of the menstrual flow. In general softening of the vessel-walls nose-bleed usually begins after an exertion, and is exceedingly difficult to arrest. When the bleeding originates in the vault of the pharynx, the blood flows posteriorly when the patient is sitting up or standing.

Etiology.—Epistaxis may be the result of blows upon the nose, falls, picking with the finger-nails, the introduction of a foreign body, forcibly blowing the

nose, sneezing, etc. It is a frequent symptom of the majority of nasal tumors, and of the forms of rhinitis accompanied by ulceration.

The use of a powder of a light color advised to discover the bleeding spot. Aristol is valuable for this purpose, and also as a styptic. T. V. Fitzpatrick (Cincinnati Lancet-Clinic, Nov. 7, '91).

In 250 cases, including 150 males and 100 females, seat of the hæmorrhage upon the cartilaginous portion of the septum in 219 instances. The causes were varied; small varicose veins or erosions furnished the stream in all but 11 cases, these being of arterial origin. Baumgarten (Revue Inter. de Rhinol., d'Otol., de Laryn., et d'Ophthal., vol. iv, No. 15, '94).

Spot from which the hæmorrhage is situated on the septum about midway between the anterior and posterior margin of the cartilaginous plate, and the bleeding is caused by granulation-tissue. Such granulations removed with the finger-nail until all sponginess to the touch has disappeared. C. Seiler (Southern Clinic, Oct., '95).

The great majority of spontaneous epistaxes originate from the artery found near the anterior portion of the septum. The introduction of a pledget of cotton saturated with a 5-per-cent. solution of cocaine causes the bleeding to stop sufficiently long to enable the operator to find a punctiform erosion from which the blood oozes. Houdeville Martin (Revue Gén. de Clin. et de Thér., Jan., '93).

The artery of the anterior (cartilaginous) septum may lie near the surface, be of considerable size, and, if atheromatous, may cause serious hæmorrhage. Getchell (Boston Med. and Surg. Jour., vol. cxxxi, No. 1, p. 9, '94).

Literature of '96-'97-'98.

Epistaxis is a surgical affection and with certain rare exceptions is due to a definite local lesion requiring topical treatment. The exceptions are those cases where the whole pituitary mucous membrane is in an oozing condition, as in hæmorrhagic small-pox, purpura, and scurvy. Otherwise there is a definite

local lesion, of which the "seat of election" is on the anterior inferior portion of the septum, almost immediately behind the nostril. Lermoyez (*Archives de Laryn.*, Nov. to Dec., '96).

It occasionally occurs as a vicarious substitute for menstruation. Some authors have sought to establish a connection between recurrent epistaxis and pelvic disorders of the female; congestive turgidity of the turbinals is frequently noticed during menstruation, and impeded circulation may thus act as a primary factor in the nasal hæmorrhages.

The genital factor in the production of epistaxis during adolescence particularly insisted upon, the exciting cause being either psychological, pathological, or artificial. The reflex connection between the nasal mucous membrane and the genital organs readily explains how epistaxis may be caused by engorgement of the nasal corpora cavernosa. Joal (*Revue Mens. de Laryn., d'Otol., et de Rhin.*, Feb. 1, '88).

Thirty-five cases observed in which there were connections between the nose and the generative organs and stomach. The author found turbinal hypertrophies, accompanied by dysmenorrhœa and gastralgia, and connected the latter trouble with the anterior third of the left middle turbinal, while the inferior turbinal and certain elevations on the septum appeared to be associated with painful menstruation. Cauterization of the appropriate intranasal region cured both gastralgia and dysmenorrhœa. Fleiss (*Wiener klin. Rundschau*, Nos. 1, 2, 3, 5, 8, 9, 10, '95).

An obstruction to the general circulation or any condition increasing the tension of the blood-vessels may give rise to epistaxis, while a weakened state of the septal vessel-walls, which may be local through prolonged catarrhal inflammation, or general, through degeneration of the vessels at large as a result of disease or old age, may act as a primary cause.

Disorders of the kidneys, liver, spleen, and other organs in which the blood undergoes organic changes may thus give rise to nose-bleed through mechanical impediment to its flow, and secondary engorgement of nasal blood-vessels.

Vascular degeneration regarded as the most prolific cause of epistaxis in the aged. Tautil (*Thèse de Paris*, '94).

There are three conditions which contribute to epistaxis in advanced nephritis: (1) interstitial nephritis, of the toxic kind, in arthritic subjects; (2) when there are alterations of the blood: anæmia or hydræmia; (3) modifications of the walls of the renal blood-vessels, which facilitate hæmorrhages and render them graver. M. H. Barth (*L'Union Méd.*, Aug. 30, '92).

Evidence in favor of the hepatic origin of nasal, as well as anal, idiopathic hæmorrhage. The starting-point in the constitutional disorder is due to an abnormal condition of the tissue or cells in the liver; secondarily, the blood and general constitution. A. Harkin (*Dublin Jour. of Med. Sci.*, June 1, '92).

In children, nasal hæmorrhage is almost always the result of latent disease of the liver. In adults the hæmophilic form is generally associated with arthritism, and especially with the lesions of the liver caused by arthritic disease. Instead of tonics and milk diet, an alkaline and vegetable diet, with general and local douches, should be ordered. Verneuil (*Le Progrès Méd.*, June 2, '94).

Epistaxis may also be the result of obstruction to the return of blood to the heart through pressure upon the jugular veins by tumors, close-fitting neck-wear, etc., and through valvular disorders of the heart inducing vascular tension. A constitutional susceptibility to hæmorrhages exists in some persons, the bleeding being at the nose in the majority of cases; in these, the liability to epistaxis may be congenital.

Bleeding at the naso-pharynx and into the pharyngeal cavity is occasionally witnessed and sometimes gives rise to ap-

prehension lest the hæmorrhage be from the lungs. Hence an examination of the naso-pharynx is always indicated when deciding as to the presence of phthisis, after hæmotysis.

Although hæmorrhage from the vault of the pharynx, on a level with Luschka's bursa, is rare, the possibility of its origin from the pharyngeal vault should be remembered. Mounier (*La France Méd. et Paris Méd.*, May 6, '92).

Epistaxis occurs as a premonitory or concomitant symptom in a number of affections, such as typhoid and remittent fevers, scurvy, diphtheria, and the exanthemata. In plethora and when the cerebral circulation is overloaded, a free nose-bleed is generally productive of great relief.

Pathology.—The profuseness with which the nasal mucous membrane is supplied with blood-vessels furnishes a ready explanation for the copious hæmorrhages which occur as a result of traumatism. A blow, by suddenly increasing the blood-pressure, readily causes rupture of one or several blood-vessels. The fact that arterial blood is generally lost indicates that the venous sinuses are but seldom involved. Picking the nose, by denuding the membrane of its epithelium, especially over the septum, exposes the underlying membrane proper, tearing some of the numerous blood-vessels. The hæmorrhage sometimes originates in the posterior nasal cavity, especially in the mass of glandular tissue with which the vault is furnished.

Prognosis.—Epistaxis is rarely fatal, but danger is greatest in young subjects, especially those suffering from hereditary syphilis. Nurslings and the aged in debilitated health are also prone to a fatal form, owing to the friability of their vascular walls. In practically all cases of nose-bleed, however, the flow is soon arrested by appropriate measures.

Case of uncontrollable epistaxis resulting from a blow on the nose received during infancy reported, the blood flowing in a stream three or four hours and leaving the child pallid and dull. These attacks occurred about twice a month. If they did not occur for three or four weeks he would become lethargic and sleepy. Remedies were of no avail. Chisolm (*Maryland Med. Jour.*, Dec. 24, '87).

Literature of '96-'97-'98.

Four instances of fatal epistaxis in nurslings less than a month old observed, which, to superficial observation, exhibited a typical picture of melæna. Two of the infants had hereditary syphilis, and at the autopsy were found to have nasal diphtheria. In the third child, the nasal bleeding complicated buccal hæmorrhage and purpura following purulent rhinitis consecutive to a bilateral blennorrhagic ophthalmia. At the autopsy there was found almost complete destruction of the nasal mucosa, laying bare the bone. In the last case the nasal hæmorrhage could be attributed to no definite cause. The mucosa was found to be simply congested and tumefied. Beneath the dura was found a clot covering almost the entire left hemisphere. In all these cases the bleeding had not appeared externally, but had passed by way of the naso-pharynx into the stomach. Swoboda (*Wiener klin. Woch.*, No. 41, p. 916, '96).

Persistent and recurrent epistaxis is most frequently met with between the ages of 15 and 25 years. The bleedings are frequent and severe; they may occur on very slight provocation. The bleeding may be from one or both nostrils, or from the tear-duct. On irritation by means of a probe, of the membrane covering the cartilage of the affected side, blood will begin to ooze, at first very slowly, but ultimately with greater freedom. No other area inside the nose responds to irritation in this way, and the cartilaginous area in a patient with no history of epistaxis does not do so. The average size of the hæmorrhagic area is about equal to that of a silver three-penny piece. G. H. Mackenzie (*Scottish Med. and Surg. Jour.*, Oct., '97).

Case of epistaxis in most serious form necessitating ligation of the common carotid, followed by recovery. Max Thorner (*Nashville Jour. of Med. and Surg.*, Nov., '97).

Treatment.—The importance of the upright position in these cases is frequently overlooked. Gravity plays its part here as well as elsewhere, and the mere change from the recumbent to the sitting posture is frequently sufficient to arrest the flow of blood. When there is great tendency to coma, however, the sitting posture should be tried, and if this cannot be endured, lying flat on the back is the next position.

The patient should always sit up before an open window,—never lie down. Ice may be used locally and to the back of the neck. The lower extremities should be immersed in hot water up to the knees, or the lower limbs bound with hot cloths, and small doses of digitalis with ergot may be given every three hours. Marmaduke Sheild (*Clinical Jour.*, July 31, '95).

The hæmorrhage can frequently be arrested by simply closing tightly the bleeding nostril for a few minutes, especially when the flow arises from the anterior portion of the septum. Pressure upon the artery of the septum as it enters the nostril, or upon the branch of the facial, situated close to the alæ, will sometimes suffice. Raising the arms above the head to force the blood to mount against gravity, thus encouraging the formation of a clot, is also recommended. Among the simple measures recommended have been water, as hot as can be borne, glycerin, or lime-juice, either of which is to be injected into the bleeding nostril.

Irrigation with water as hot as can be borne suggested. Joal (*Revue Mens. de Laryn., d'Otol., et de Rhin.*, Feb., '88); Alvin (*La Semaine Méd.*, June 20, '88).

Epistaxis checked by means of injections of lemon-juice after every kind

of hæmostatic had failed. After washing the nostril with fresh water, with a glass urethral syringe, as much freshly squeezed lemon-juice as the syringe will hold is injected. One injection is usually sufficient. Citric acid is without effect, therefore the effects of the lemon-juice not attributed to the citric acid, but to the combined substances which the juice contains. Geneuil (*Brit. Med. Jour.*, Dec. 22, '88).

In a case of repeated and excessive epistaxis, lime-water in liberal quantity administered; the hæmorrhage ceased and remained absent until patient neglected the use of the remedy. Watkins (*N. Y. Med. Jour.*, Aug. 13, '92).

Certain repeated epistaxes, due to traumatic erosion on the antero-inferior aspect of the septum, are rapidly cured by filling the anterior nares with vaselin two or three times daily for two or three weeks. Ruault (*Arch. de Laryn., de Rhin., et des Mal. des Premières Voies Respir. et Digest.*, Dec., '89).

In habitual epistaxis a loose plug of absorbent cotton saturated with full-strength official solution of hydrogen dioxide inserted into the bleeding cavity, supplemented by firm compression of the nose with the fingers, is an effectual means. E. L. Vansant (*Phila. Poly-clinic*, Feb. 2, '95).

Derivative treatment, such as hot foot-baths, mustard plasters to the back of the neck, ankles, or chest, may also be employed, while stimulation of the vasomotors can be induced by the application of cold, in the form of ice, cold compresses, ice-bags over the nose, forehead, etc.

Flexible rubber tube, one end of which projects into a soft-rubber bag, recommended. The bag, being introduced into the nostril, is filled with water, the other end of the tube being then closed by means of a stop-cock. J. W. McCoy (*Med. Record*, Aug. 10, '89).

When these simple means fail, the local application of styptics may be employed. Sniffing ice-water, into which a little salt has been dissolved, is some-

times very effective. Insufflations of tannic acid, gallic acid, or alum, either separate or combined, and antipyrine will arrest the bleeding in most of the severe cases.

Antipyrine produces a constriction of the vessels and of the tissues at the same time that it produces coagulation of the blood. It may be used in powder in solution, incorporated into gauze, or in ointment. For operations it may be used in a 5-per-cent. solution. Hénocque (*Arch. de Laryn., de Rhin., et des Mal. des Prem. Voies Respir. et Digest.*, Apr., '88).

Antipyrine possesses, in a 4-per-cent. solution, decided hæmostatic effect, though not superior to that of cocaine. Hinkel (*N. Y. Med. Jour.*, Oct. 20, '88).

The styptic preparations of iron are preferred by some, but I have not found them more effective than the above, while their use is much more unpleasant to both patient and physician. Solutions of sulphate of zinc, acetate of lead, or sulphate of copper (30 grains to 1 drachm) may be applied with a syringe or with the atomizer. Cauterization of the bleeding spot has been recommended, but the necessary instruments are seldom at hand. The same is the case with electrolysis.

Cautery-point to be applied in cases due to traumatic erosion on antero-inferior aspect of septum. F. H. Potter (*Jour. Amer. Med. Assoc.*, Sept. 27, '90).

Interstitial electrolysis should be the method of choice when extensive epistaxis occurs from erectile or varicose tissue. Electrodes of copper or silver are preferable. The intensity of the current should average from 16 to 20 milliamperes, and the length of the *séances* from 8 to 10 minutes. Three or four applications are sufficient in exceptional cases, one or two in ordinary instances. Miot (*Annales des Mal. de l'Oreille, du Larynx, du Nez, etc.*, June, '94).

Cauterization of bleeding spots with crystalline chromic acid recommended. Pogorelsky (*Medycyna*, No. 51, '91).

Three-per-cent. solution of trichloroacetic acid in persistent epistaxis recommended as a substitute for the chloride of iron. It may be applied on cotton wrapped around a probe. The intense burning sensation which it causes may be overcome by the addition of a 20-per-cent. cocaine solution. Cozzolino (*Wratch*, No. 82, '94).

Literature of '96-'97-'98.

Treatment may be local or general. A solution of cocaine is applied to the anterior septum, and the part is then subjected to linear cauterization with the electrocautery. An almost equally good result may be produced with chromic acid or solid nitrate of silver. G. H. Mackenzie (*Scottish Med. and Surg. Jour.*, Oct., '97).

In connection with the treatment, blowing of the nose should be avoided for some time, so as not to remove the clots which arrest the bleeding mechanically.

When evidences of weakness become apparent, such as pallor, vertigo, etc., mechanical means must be resorted to. The simplest of these is to pack the bleeding cavity with pledgets of cotton, lint, or bits of sponge, previously dipped in some styptic solution, and of sufficient size to exert pressure when in place. Any blunt instrument may be used to mass them in, one after the other. They can be withdrawn with dressing-forceps after twenty-four hours, and new ones replaced if necessary. R. J. Levis used small pieces of sponge passed successively over a piece of twine.

An effective method is to employ 15 long threads of patent lint, $3\frac{1}{2}$ or 4 inches long; these are doubled on themselves and tied in the middle by a string, one end of which is left 6 or 8 inches long, for ease in extraction. The bundle of threads is passed back into the posterior nares by a probe and left there; the probe is withdrawn and the anterior nares plugged. These 20 or 30 ends

floating in the blood at once coagulate it. W. W. Parker (Med. Rec., Oct. 4, '90).

A piece of old, soft, thin cotton, about six inches square, by means of a probe is pushed, "umbrella" fashion, into the nostril, the direction of pressure, when the patient is sitting erect, being backward and slightly downward. It is pushed on until it is felt that the point of the "umbrella" is well into the cavity of the naso-pharynx.

A considerable quantity of cotton-wool is pushed well back to the bottom of the sac in the pharynx. Then, the probe being held well against the packed wool, the mouth of the sac is pulled upon, and thus its bottom is drawn forward and forms a firm, hard plug, wedged into the posterior nares. The sac may now be packed full of cotton-wool. The mouth of the sac is tied just outside the nostril, trimmed with scissors, and the ends of the thread secured outside.

In removing the plug, gently remove the cotton-wool bit by bit, then gently pull out the sac, or if adhering apply a little warm water. A. A. Philip (Brit. Med. Jour., July 18, '91).

In some cases, the point of origin of the hæmorrhage is so far back that anterior packing is not sufficient. Resort must be had to posterior tamponing, a rather difficult procedure in most cases. Bellocq's cannula, an instrument especially adapted for the purpose, was formerly used, but its drawbacks and the fact that it was seldom obtainable has caused its practical abandonment. Any of the packing methods already described can be employed as advantageously if care is taken that the substances used—cotton, lint, sponge, or thread—be in sufficient quantity to completely occlude the post-nasal opening. If left in place too long, tampons may cause suppuration of the middle ear; they should, therefore, be changed after twenty-four hours, or, at most, forty-eight hours.

Plugging the nasal cavity with a Bellocq sound often gives rise to dangerous sequelæ. The pledgets cannot be left long in position, and their extraction is very prone to start bleeding afresh. J. G. Macnamara (Northwestern Lancet; Western Med. Reporter, Mar., '95).

As the hæmorrhages nearly always arise from the anterior portion of the nasal cavity, there is no necessity of tamponing far back. Lermoyez (Med. and Surg. Reporter, Apr. 6, '95).

Several cases reported of epistaxis through the eyes, following nasal plugging. Editorial (Medical News, Dec. 21, '95).

In many cases suppurations of the middle ear are liable to occur after plugging. Gellé (Archives Inter. de Laryn., de Rhin., et d'Otol., No. 3, '92).

Case of otorrhœa occurring as a result of the continued presence of a tampon introduced and left *in situ* by a hospital nurse for six days. Chatellier believes that the application of anterior plug is adequate. Natier (Revue Méd., Aug. 7, '92).

In cases of recurrent epistaxis, the likelihood of organic cardiac lesions, or of hepatic, pelvic, or renal disorders should be borne in mind, and appropriate measures instituted if need be. In such cases treatment of the nasal mucous membrane proves inadequate, especially when the vascular tension is marked.

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ERGOT.—Ergot, popularly known as spurred rye, is the sclerotium of a fungus (the *Claviceps purpurea*) which attacks and finally supplants the grain in the common rye (the *Secale cereale*). It presents itself in grains of a slightly-curved, fusiform shape, which are brittle, yet moderately flexible. It has a disagreeable, fishy odor, and a somewhat bitter, acrid taste. Ecboic acid, ergotic acid, sclerotinic acid, ergotine and er-

gotinine, and ecboline have been isolated by chemists who have claimed each to be the active principle.

Substance called ergosterin, obtained from ergot. The method of preparation is to exhaust the ergot with alcohol, allow the alcohol to evaporate, and treat the residue with ether, which dissolves the ergosterin. C. Tanret (Pharm. Zeit. f. Russland, May 23, '89).

Ergotinol is a new preparation of ergot obtained by exhausting powdered and oil-free ergot with water. The extracts obtained are treated with acids and hydrolyzed. The acid is then neutralized and alcoholic fermentation induced. The product is then subjected to dialysis, and concentrated until 1 cubic centimetre of ergotinol corresponds to 0.5 gramme of extractum secalis cornutum. Ergotinol is a substitute for the extract, without possessing the unpleasant properties of the latter. Editorial (Pharm. Zeitung, xlii, 141).

Literature of '96-'97-'98.

Two new constituents of ergot are named chrysotoxin and secalintoxin. The former is a combination of a non-nitrogenous resin, "sphacelotoxin," which possesses the pharmacological properties peculiar to ergot, with another substance, "ergochrysin," which is itself inactive. The latter is a compound of the same active resin, "sphacelotoxin," with an inactive alkaloid, "secalin." The pharmacological actions of chrysotoxin and secalintoxin are alike in kind, but differ in degree, and are due in each case to the sphacelotoxin component. Neither of these compounds present the characteristic actions of the alkaloid cornutine, and cannot, therefore, be regarded as containing that body; the peculiar convulsive effect of cornutin, and also its action upon the uterus and its contents, is one of the disadvantages of employing the crude ergot in medicine. C. Jacobs (Archiv f. exper. Path. u. Pharm., Apr., '97).

Kobert claims that there are—besides the above active principles—ergotinic acid, sphacelinic acid, and cornutin.

The virtues of the latter two ingredients, however, are lost by long keeping.

Solution of ergotine can be preserved antiseptic for at least five days, if a few drops of carbolic acid be previously added to the solution. Aufrecht (Therap. Monats, May, '91).

Literature of '96-'97-'98.

Ergotinol considered preferable to other preparations of ergotine on account of the ready adjustment of its doses, its prompt action, and particularly its keeping qualities. No unpleasant effects observed. Abel (Berl. klin. Woch., No. 8, '97; Deut. med. Zeit., July 29, '97).

Kobert believes cornutin to be a true alkaloid and teaches that the chief activity of the drug is dependent upon it and the sphacelinic acid. Tanret, however, denies the existence of cornutin as an alkaloid.

Preparations and Dose.—Ergot, 15 to 30 grains.

Extract of ergot (solid extract), 5 to 20 grains.

Extract of ergot (fluid), $\frac{1}{2}$ to 1 drachm.

Wine of ergot, 2 to 4 drachms.

SUBCUTANEOUSLY.—Bonjean's ergotine (Fr. Cod.) and Squibb's ergotine are especially prepared for hypodermic use, 5 parts being dissolved in 7 parts each of glycerin and water and then filtered, 3 to 12 grains (representing 120 grains of crude ergot) of the ergotine being the proper dose.

Hypodermic injections of ergotine should be given into the back or hips, and the solution should be fresh, made, if possible, at the bedside. Lilienfeld (Centralb. f. Gynäk., Nov. 26, '87).

Symptoms of local irritation will not follow injections of ergotine unless decomposition has taken place in the fluid. The site of the injection is a matter of indifference, except that the abdominal parietes should not be chosen. Englemann (Centralb. f. Gynäk., No. 1, '88).

Ergotine should be dissolved in distilled water, as it causes pain when it is dissolved in impure water, alcohol, or glycerin. Aufrecht (*Fortschritte der Medicin*, July 15, '91).

Physiological Action.—In very small doses no appreciable effects are produced except in labor. In therapeutic doses its principal action is upon unstriated muscular fibre, producing a contraction of the blood-vessels, especially those of the spinal cord, dilatation of the pupils, and contraction of the uterus.

As it is a powerful stimulant of the vasomotor nerve-centres, it causes tonic spasm of the muscular coats of the blood-vessels accompanied by a rise of arterial pressure and a slowing of the heart-beat. This rise of arterial tension is preceded by a fall which is due to the depressant action of the drug in direct contact with the heart-muscle, and, if the dose be very large, the fall of pressure is never recovered from and progressive paralysis of the vasomotor apparatus and heart occurs (Hare). Hemmeter believes that the uterine contractions produced by ergot are produced by stimulating the centres in the lumbar portion of the spinal cord which control this viscus. It has heretofore been accepted that the contraction was due to its direct action upon the unstriated muscular fibres of the organ. Both theories are probably true.

Ergot produces no vascular contractions, but acts directly on the peripheral uterine ganglia. It has no direct action upon the blood-pressure, and must, therefore, have a specific action on the blood, which is thus more readily clotted at susceptible points in the vascular system. Ellinger (*Sanitary Inspector*, July 4, '91).

Under full doses of ergot the respiratory movements are slowed, intestinal peristalsis is stimulated, and the secretion of urine is increased. The toxic

effects, in man, are seldom produced save by large and long-continued doses.

The action of ergot usually begins within fifteen minutes after its ingestion, and attains its maximum intensity in thirty minutes. Its effects last for an hour, when the dose must be repeated if its continued action is desired.

Poisoning by Ergot (Ergotism; Acute Poisoning).—Very large doses of ergot produce symptoms of gastro-intestinal and cerebro-spinal origin. When taken by mouth ergot produces a heat and dryness of the throat, thirst; gastric pain, with nausea or vomiting; intestinal colic and diarrhoea, giddiness, headache, restlessness and even delirium, coldness of the surface of the body, dilatation of the pupils, and a great retardation and slight weakness of the pulse.

CHRONIC POISONING.—When ergot is used for a long time as food (bread made from diseased grain) chronic poisoning occurs which may assume two forms, the convulsive and the gangrenous, which are well described by Bartholow:—

The convulsive form begins by vertigo, disorders of vision, tinnitus aurium, numbness of the fingers and toes, and afterward of the integuments. These symptoms are followed by spasmodic contractions of the muscles, opisthotonos or emprosthotonos supervening. Complete anaesthesia after superficial follows, and gangrene may occur. The organs of sense are blunted. The pupils are dilated; sometimes unequal and various disturbances of vision ensue. Epileptiform convulsions may occur in addition to the tetanoid spasms; delirium appears, followed by complete insensibility.

Between the latter part of 1889 and autumn of 1890, in the State of Wjatka, 2749 people suffered from ergot poisoning, 535 cases of which proved fatal. Convulsions were observed in all cases; no gangrene was noticed. In 7 cases the

liver, spleen, and kidneys were examined microscopically. The spleen showed the following changes: The connective-tissue frame-work strongly marked, the pulp hyperæmic, the Malpighian bodies distinctly marked, a few greatly enlarged and hyperplastic, others appear in the centre as a uniform layer with no nuclei. The arterial walls, particularly the central vessels of the Malpighian bodies, are thickened, glossy, and show hyaline degeneration. The liver is hyperæmic, the liver-cells atrophied, the nucleus either lost or the staining unsatisfactory; the arterial wall had the same changes as in the spleen, the lumen at times entirely obliterated, results of coagulation-necrosis of the liver-cells. In the kidneys the changes prevail in the cortex-substance, hyperæmia of the glomeruli, formation of a uniform mass in Bowman's capsule, with consecutive compression and changes of the glomeruli, glossy-looking changes in the blood-vessels, with coagulation-necrosis of the epithelium of urinary tubules. N. Winogradow (Wrathe, Nos. 21, 23, '95).

The gangrenous form is ushered in by a tingling numbness, formication, fatigue, earthy hue of the skin, coldness of the surface; nausea, vomiting, and diarrhœa, with intestinal colic, follow. Muscular contractions take place, an eruption of vesicles filled with a dark, ichorous fluid appears on the extremities, and gangrene, dry or moist, sets in. Bartholow refers the phenomena to two causes: to the dyscrasia which exists in the subject of this malady referable to insufficient food and bad hygienic surroundings, and to the action of the ergot in diminishing the blood-supply to the cerebro-spinal axis, to the vegetative organs, and to the skin and muscular system.

Treatment of Poisoning by Ergot.—In cases of acute poisoning the bowels should be opened by quick purgatives: by castor-oil or Epsom salts. Tannic or gallic acid should be given internally. The recumbent posture should be main-

tained, the patient be stimulated with brandy or other spirits, and given amyl-nitrite by inhalation.

Therapeutics.—The therapeutic value of ergot depends upon its characteristic action on unstriated muscular fibre and its influence on the sympathetic system. It is mostly used by obstetricians and gynæcologists to cause uterine contraction. Its action on the non-pregnant normal uterus is slight and uncertain, and increases in certainty and efficiency as the womb increases in size. Its use as an oxytocic is not generally sanctioned by the authorities.

LABOR.—Full doses of ergot are never to be given to hasten the delivery of a fœtus, because it causes tonic contraction of the uterus, interruption of the placental circulation, endangering the child through asphyxia, and should operative procedures be necessary they are greatly embarrassed by the rigidity of the uterus, and the danger of the uterine rupture is increased.

Ergot given prior to delivery produces a frightful mortality among infants, and is the most frequent cause of retention of the placenta, as well as of other abnormal conditions. It is never necessary except hypodermically in dangerous post-partum hæmorrhage in rare cases. J. W. Hyde (Amer. Med. Digest, Apr. 15, '88).

Ergot injections found invaluable in external hæmorrhage due to uterine inertia in labor. Ch. Liégeois (Revue Gén. de Clin. et de Thér. Jour. des Prat., June 22, '95).

Literature of '96-'97-'98.

The conditions and circumstances under which ergot may be employed in obstetrics are (1) that the presentation may be natural or cranial, except in some instances of breech presentation, in which it may be necessary to deal at once with uterine inertia; (2) that there should be no marked disproportion between the fœtus and mother, or any

other physical impediment in the genital tract to delivery; (3) that the os uteri, if not previously fully dilated, should be so dilatable as to allow speedy extraction by the forceps when necessary; and (4) that the preparation selected, the dose, and the method in which it is employed, should be well calculated to produce the required effect.

Subject to these conditions, ergot may, with utility, be employed when actually indicated and judiciously administered either before, during, or after the second stage of labor. That is to say, it may be given before the full dilatation of a dilatable os, (1) in some instances of long delay from uterine inertia in which there is imminent danger to mother or child, or (2) risk of subsequent flooding from further protraction of the case. During the second stage it may be employed (3) in labor rendered abnormally tedious by deficiency of uterine action or otherwise complicated, and in which the presentation is natural and no other impediments to delivery exist; or (4) for the prophylaxis of apparently impending flooding. During the third stage ergot may be resorted to (5) for the expulsion of the placenta when retained by inertia, or (6) for the arrest of loss of blood. After delivery this ecboic may be employed either immediately (7) to check or prevent hæmorrhage, or subsequently (8) to produce tonic or permanent contraction; or it may be exhibited (9) for the purpose of expelling clots from the womb and so arresting after-pains. Lastly, (10) in the majority of multiparous patients ergot may be administered during the puerperal period, with the object of stimulating the muscular tonicity of the uterus. Thomas More-Madden (*Lancet*, May 29, '97).

Small doses, 10 minims of the fluid extract repeated hourly, as suggested by Wood, may serve to intensify the pains of a slow labor or incite them in uterine inertia. Instrumental delivery, however, is generally preferred to the use of ergot. The proper time for the exhibition of ergot is generally conceded to be at the end of the third stage—after the delivery of the child and the placenta—when it

aids in producing a firm, lasting contraction of the uterus. It is especially indicated if an anæsthetic has been required to effect delivery. It is useful as a prophylactic against, and a remedy for, post-partem hæmorrhage.

Cornutin in inertia uteri, during parturition, cannot be recommended as effectual. It is of especial value in atonic post-partum hæmorrhage, and in the hæmorrhage following an abortion. It also acts promptly in the metrorrhagia and menorrhagia that occur in consequence of endometritis, metritis, or other diseases of the uterus or its appendages, and can be given hypodermically in doses of $\frac{1}{32}$ to $\frac{1}{10}$ grain, or $\frac{1}{16}$ to $\frac{1}{8}$ grain, internally. A solution usually gets milky in from eight to fourteen days, and it is then useless. Injurious effects never noticed. H. Thompson (*Centralb. f. Gynäk.*, Mar. 16, '89).

Cornutin has not proved reliable in a number of cases where it was used to control uterine hæmorrhages due to atony of the muscles after confinement, and in other gynæcological troubles. The effect of ergotine is persistent, and in every way is superior to cornutin. Editorial (*Wiener klin. Woch.*, Nos. 22 and 23, '95).

ABORTIONS.—Ergot is here useful if the uterus remains relaxed, but is contra-indicated before the uterus has been emptied. It is useful in the subinvolution consequent upon abortions, given continually in small doses.

HÆMORRHAGE.—Ergot is used in hæmorrhagia dependent upon the presence of fibroids or other neoplasms. It was used formerly to cause shrinkage of uterine fibroids, but surgical methods are now more in favor.

In the treatment of uterine fibroids by the injection of fresh, pure solutions of ergotine the needle should be inserted for not more than $\frac{1}{8}$ to $\frac{1}{4}$ of an inch into the anterior or posterior lip, but never into the body of the uterus or into the tumor itself. Schücking (*Centralb. f. Gynäk.*, Feb. 25, '88).

Literature of '96-'97-'98.

Indications for ergotinol are the same as for ergot. Maximum dose used, 30 minims daily. In case of fibroma with excessive menorrhagia, one injection daily for eight days during the menstrual epoch given with excellent results. M. Abel (Med. and Surg. Reporter, June 5, '97).

In pulmonary hæmorrhage its use is not advised, because of the increased vascular tension which it produces. For the same reason it is not advised in cerebral apoplexy. On other forms of hæmorrhage, however, it is a valuable hæmostatic: in epistaxis, in hæmaturia (renal or vesical), in purpura hæmorrhagia, the hæmorrhage of scurvy, etc. It has been used also in the intestinal hæmorrhage of typhoid, in dysentery with bloody stools, in serous diarrhœa, and in bleeding hæmorrhoids.

DIABETES.—The use of ergot combined with the bromide of sodium is advised by Hare in the treatment of diabetes insipidus.

GENITAL DISORDERS.—Ergot has been employed with good effect in spermatorrhœa and in deficient tone of the genital organs.

Citrate of cornutin recommended in the treatment of spermatorrhœa. Doses of $\frac{1}{20}$ to $\frac{1}{10}$ grain. The remedy is always well borne, even when continued for several months. It is especially valuable in the paralytic form of the disease, but fails in the spasmodic form, such as that which succeeds inflammation of the seminal vesicles or vas deferens. Bökai (Medizinisch-chirurgisches Rundschau, No. 9, '93).

Citrate of cornutin in its action on the uterine tissues has given good results in daily doses of $\frac{1}{6}$ grain, taken in three doses, in urethral hæmorrhage, and also vesical and uterine. Citrate of cornutin has produced cures in divers cases of paralytic spermatorrhœa. It acts in these cases by diminishing the medullary irritability, and particularly that of the

genito-spinal centre. A. Meisel (La Méd. Mod., Mar. 23, '95).

Hypodermic injections about the dorsal vein of the penis are useful in impotence when the trouble is due to its emptying too soon. It is used in enlarged prostate with retention of urine and in enuresis.

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ERYSIPELAS.

Definition.—By erysipelas is meant a violent inflammation of the superficial lymph-channels.

Symptoms.—Erysipelas is most frequently found about the face and head, probably because of the excessive number of superficial lymphatic vessels. The affection has gradually lessened through the use of antiseptic principles in surgical practice.

Six cases of erysipelas of the pharynx and larynx. Hall (Brit. Med. Jour., Feb. 27, '92).

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Case of erysipelas manifesting itself first in the fauces and tongue and extending painlessly up the Eustachian tube to the face. On three separate occasions the disease started from the same site—i.e., the neighborhood of the left ear—and spread all over the face, and was complicated by infective endocarditis. Magill (Lancet, Feb. 19, '98).

True cutaneous erysipelas is characterized by severe elevation of temperature, attended by a disseminated inflammation of the skin. This is sometimes preceded by a chill. The elevation of temperature continues until the erysipelatous process reaches its end. There may be a wound from which the redness starts, or there may be no cutaneous evidence of the seat of infection. A mere scratch, though healed, may have al-

lowed the streptococcus to enter; having traveled up the lymphatics, the organism starts the erysipelatous process at a distance from the seat of entrance. There may be red streaks showing lymphatic glands extending from the wound to the special place where the poison now develops very freely.

Case reported where a woman using the tuft which her husband had used to dust his face with rice-flour during an attack of erysipelas a month previously, was seized with purulent ophthalmia and lost an eye. Saint Phillippe (*Jour. de Méd. de Bordeaux*, Nov. 18, '88).

The lesions in erysipelas of the newborn are nearly the same as in adults, the skin and the subcutaneous layer being almost normal. Morel (*Revue Mensuelle des Mal. de l'Enfance*, Mar., '91).

Erysipelas in the newborn may develop not only about the umbilical wound, but also around a vaccination-wound and around the conjunctiva. Histological examination shows accumulations of streptococci in the lymphatic vessels. There may be a few bacilli in the superficial region of the derma, but none in the epidermis. At first the fever is not excessive, and it may not be noteworthy until the second or third day. If the child do not quickly die there may be several resulting abscesses, and death may ensue from the fifteenth to the twentieth day. If recovery take place it may be long in coming, being delayed by athrepsia or infectious diarrhœa. Lemaire (*Revue des Sci. Méd. en France et à l'Etranger*, Jan. 15, '94).

In 100 cases of erysipelas just one-half were clearly traceable to pre-existing skin lesion. Charles W. Allen (*Med. Record*, Nov. 23, '95).

Erysipelas of the face and head following otitis observed seven times within a period of six months. Hessler (*Le Bull. Méd.*, July 7, '95).

Literature of '96-'97-'98.

In some places in Nevada erysipelas is epidemic, and there is a considerable difference in the virulence of the disease.

Furley (*Kansas City Med. Record*, Jan., '96).

Tension of the cellular tissues now becomes very marked; blebs may form on the surface from the intense irritation of the papillary layer of the skin. It sometimes happens that the process, having started in one part of the body, may be arrested, only to manifest itself elsewhere. As a rule, after the process subsides the parts are soon restored to their normal condition, although a certain amount of desquamation takes place.

When the deeper lymphatics are affected a great deal of effusion takes place in the cellular tissue, and cellulitis results, which is much more intense than that described as arising from the streptococcus in its ordinary degree of virulence. It bears, however, a great analogy to it, only the symptoms may be much more intense. A suppurative process takes place with a great disintegration of cellular tissue. This has been characterized as phlegmonous, or suppurative, erysipelas. It may come to the surface, and subsequently change its course as an erysipelas of the skin. It is also possible that other bacteria should contaminate this infection.

The constitutional symptoms correspond to the intensity and extent of the local process. The temperature rises to about 104° F., and may reach 107° F. The fever may be of a continuous remittent or intermittent type, and is in direct proportion to the extent of the inflammation. There may be gastric symptoms, loss of appetite, nausea, vomiting, excessive thirst, and a highly-coated tongue. The urine is generally dark colored, and may contain albumin, blood, bile-pigment, and micrococci. The spleen is sometimes swelled, and there may be pain in the region of the kidneys. If the process be not arrested, death may

result from the extension of the local infection to some vital organ, as the brain or peritoneum.

Case of erysipelas in a pregnant woman. Premature labor occurred, and the child was born having the disease, which affected the same parts as those involved in the mother. If the disease does not occur until near the end of pregnancy, the probability of premature labor is not great. Kime (*Western Med. Reporter*, p. 134, '88).

In the majority of cases erysipelas does not cause abortion. If confinement or miscarriage occur during its course, there is no genital infection, provided obstetrical antisepsis be rigorously practiced; moreover, the children at birth show no trace of erysipelas. Le Gendre (*Gaz. des Hôpitaux*, Dec. 23, '92).

Synovitis or suppurative arthritis may occur as a complication of erysipelas. In 817 cases of erysipelas one or the other of these conditions took place. The complication may arise at any time during the attack. The suppurative form requires the promptest and most heroic treatment. Disorganization of the joint will follow, even the death of the patient, otherwise. Gamgee (*Birmingham Med. Rev.*, vol. xxxviii, No. 205, '95).

Suppurative arthritis of the knee following erysipelas observed, in which was found Fehleisen's streptococcus. Schreiber (*Bolnitchnaja gazeta Botkina*, No. 2, '91).

Case considered as one of infective pneumonia, due to extension of an erysipelas of the pharynx down the bronchial tract to the parenchyma. Collins (*Il Morgagni*, Aug. 29, Oct. 15, '91).

Endocarditis is very rare in erysipelas, as is albuminuria. Sublimate dressings are irritating and liable to produce pigmentation. Guyot (*La Sem. Méd.*, Jan., '92).

Two cases of blindness from facial erysipelas observed. Snell (*Ophthalmic Review*, May, '93).

Many of the inflammatory complications of erysipelas are mainly due to secondary infection with pneumococci. Roger (*Revue de Méd.*, April, '95).

Following after a relapse of erysipelas,

in a young woman of 22 years, there developed peculiar black abscesses and furuncles. In the course of a year and a quarter about 650 of these were noted, affecting all parts of the body, including the hairy scalp. Fever, amounting to 100° and more, but without distinct relation to the abscess-formation, was observed. There was little depression of the general health, and the termination was complete cure. The abscesses were confined to the skin and subcutaneous tissues, and varied in size from that of a millet-seed to that of a large nut, and were marked by formation of gas in their centre and by the dark pigmentation. Bacteriological examination showed streptococci and indefinite cocci and bacilli. Zeller and Arnold (*Virchow's Archiv*, vol. cxxxix, H. 2).

Literature of '96-'97-'98.

Leucin and tyrosin demonstrated both microscopically and chemically in the urine of a girl, 18 years old, who was passing through an attack of facial erysipelas. Kirkbride (*Centralb. f. innere Med.*, No. 41, p. 1057, '97).

Death may also result from exhaustion consequent upon the febrile process and weakening of the organs by gradual infection.

The duration of the infection is very uncertain. It may seem to have disappeared, and subsequently starts up again. It may last a few hours, and continue for several weeks. Again, it may travel over the whole body and possibly attack the same locality several times. As a rule, it delineates its course within two or three weeks.

Some persons are subject to "habitual attacks" of erysipelas, generally about the face and probably repeated infections from a chronic nasal catarrh.

Case of recurring erysipelas in a young woman of 22 years. The disease first occurred at the sixteenth year, when she was ill with it for several months. After the establishment of the menses in the seventeenth year the disease recurred

with each menstruation, there having been, in all, some sixty attacks. The attacks occurred invariably on the first, second, or third day. Massalonga (*Riforma Med.*, No. 229, '94).

Literature of '96-'97-'98.

Study of 810 cases. A direct relation found between menstruation and erysipelas in only 5.2 per cent. In 1.62 per cent. menstruation could be regarded as a direct etiological factor. In 57 cases of recurrent erysipelas only 3 were due to menstruation. Erysipelas has no appreciable influence on the duration and amount of the flow. On the contrary, menstruation favors the development of erysipelas through its influence on the nervous system. Recurrences during the flow are due to the peculiar nervous state of the patient and to the persistence of colonies of streptococci in the skin and lymph-spaces, whose virulence has not been entirely destroyed. Salvy (*Gaz. Hebdom. de Méd. et de Chir.*, No. 40, '96).

In most instances spontaneous recurrent erysipelas of the face develops from the nasal fossæ through the lacrymal duct or the nostrils. The point of departure is either in the nasal fossæ or, more frequently, in the more or less hypertrophied adenoid tissue of the pharyngeal cavity. The preventive and also the curative treatment of recurrent erysipelas of the face consists in taking care of the nasal and naso-pharyngeal cavities, but especially in reducing the adenoid tissue in the pharyngeal vault, which the surgeon must remove even from between the Eustachian cushions. H. Lavrand (*Revue Hebdom. de Lar., d'Otol., et de Rhin.*, Sept. 5, '96).

In the production of facial erysipelas chronic nasal affections play an important rôle; hence the frequency with which erysipelas starts from the centre of the face, the orifice of the nostril being a favorite point of departure. F. de Havilland Hall (*Lancet*, Feb. 6, '97).

Certain attacks of erysipelas have proved a source of immunity against anthrax, at least for a few days. There is a growing opinion that it exercises a

direct effect against the development of sarcoma. Indeed, cases are reported of sarcomatous growths having gradually disappeared after an attack of purulent erysipelas; hence the practice of inoculating erysipelas in those suffering with inoperable sarcoma. This procedure is not, however, without danger to the patient, for it is not always possible to limit the development of the disease; hence the patient should be made cognizant of the risk to be run by the inoculation of erysipelas for the destruction of sarcoma.

It is only when anthrax manifests itself as a local disease that the erysipelas coccus can displace it. Pawlowsky (*Fortschritte der Med.*, Feb. 1, '88).

Anthrax immunity lasts only so long as the erysipelas cocci remain in the body, and that after ten to fourteen days the susceptibility to anthrax poisoning is as great as before. A too powerful injection of erysipelas cocci may cause death as certainly as would the anthrax poison. Mattei (*Bull. Gén. de Thérap.*, Nov. 15, '88).

Cases summarized where erysipelas has been artificially excited to cure (1) five sarcomas: three cured, two relapsed; (2) six doubtful cases (sarcoma or carcinoma): failure; (3) three ulcerative epitheliomas: failure; (4) two cicatricial keloids and "several" lymphomas: cure. Bruns (*Centralb. f. Chir.*, p. 620, '88).

Case of a woman in whom ulcerous syphilides of the face were cured by an attack of erysipelas of the face. Lop (*Marseille-méd.*, Mar. 15, '92).

When a syphilitic exanthem is unaccompanied by malignity or cachexia, a febrile erysipelas intervening is favorable. Ricard and Dupré, Lamarche, and Mauriac (*Thèse de Paris*, '56); Lop (*Marseille-méd.*, Mar. 15, '92).

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Case of advanced leprosy of the conjunctiva which was much ameliorated by an attack of erysipelas, the leprosy nodules disappearing entirely from the

conjunctiva, but recurring six months later. Terson (*Société d'Ophthal. de Paris*, Apr. 14, '96).

The danger to the patient from effect of erysipelas toxins upon malignant growths is great. The alleged successes are so few and doubtful in character that the most that can be fairly alleged for the treatment by toxins is that it may offer a very slight chance of amelioration. Valuable time has often been lost in operable cases by postponing operation for the sake of giving the method of treatment a trial, and, if the method is to be resorted to at all, it should be confined to the absolutely inoperable cases. L. A. Stimson, A. G. Gerster, and B. F. Curtis (*Annals of Surgery*, July, '96).

No one has established that the action of erysipelas has ever produced a definite cure of lupus or that it would bring about a lasting improvement. Far from trying to produce upon the tegument the bacillus of Koch and the streptococcus, one must try to avoid it by all possible means. Thibierge (*Bull. de la Soc. Franç. de Derm. et de Syph.*, June, '96).

Erysipelas can bring about improvement and even a lasting cure of lupus. One of the best chances of cure for a lupoid patient is to contract erysipelas. It may be advisable to practice inoculations with it, when we shall be in possession of a method of treatment capable of checking its progress at the right time if it happens to assume a dangerous character. Hallopeau and G. Bureau (*Bull. de la Soc. Franç. de Derm. et de Syph.*, June, '96).

The diagnosis of ordinary erysipelas is very simple. Gradually increasing and spreading redness is characteristic, and it can only be mistaken for ERYTHEMA. This latter infection, however, is not accompanied by fever, while erysipelas always is.

Complications.—The wound may apparently not be interfered with in the healing process, while at the same time a deep cellulitis exists, and may finally end in suppuration. The open wound

upon which erysipelas has developed will take a dry, gray, dirty, and glossy appearance, covered with a sort of croupous membrane, and will retain this appearance until the intensity of the infection has disappeared. On the mucous membrane a swelled condition takes place, which may also cover itself with a croupous membrane. There may be marked disturbances of the central nervous system as the result of a high fever. Delirium and stupor, accompanied by vomiting and convulsions, may follow. A collapsed condition of the system may take place after the disappearance of the symptoms. Hallucinations and certain motor disturbances may occur. As a rule, the lymphatic glands are not affected in superficial erysipelas, while they may suppurate in a deeper form of the infection. Internal complications known as metastatic inflammations may take place. These may be septic bronchitis, pneumonia, or meningitis, while peritonitis may follow erysipelas of the neighboring parts. The local sequelæ of erysipelas are a thickened condition of the cellular tissue due to the obstruction of the lymphatic vessels and an impaired condition of the vitality of the skin, predisposing the parts to eczematous ulcerations. Deep cicatrices may also form as a permanent result.

Etiology and Pathology.—Erysipelas is a violent inflammation of the lymph-channels, caused by the streptococcus. Although it is now generally conceded that the infectious agent, as described by Fehleisen as the cause of erysipelas, is identical with the streptococcus of suppuration, the symptoms of erysipelas are sufficiently different to warrant a description of this infection as a form of affection separate from ordinary suppuration. It has been proved that the virulence of the streptococcus varies ma-

terially with the nature of the soil upon which it grows; that it will frequently acquire a greater virulence when the resistance of the subject is lessened, as in tuberculosis, diphtheria, scarlet fever, small-pox, typhoid fever, and influenza, and when the vitality of the body is materially reduced, as by overwork. Its virulence materially differs in various animal organisms, as it is by no means equal to the virulence of the same streptococcus in mice or rabbits. Erysipelas can be produced in rabbits by the injection of the ordinary streptococcus of suppuration, and by that means acquire a greater virulence, and, if not attenuated, would reproduce symptoms of erysipelas in an ordinary wound infected with it. From its etiology, therefore, erysipelas is a non-specific disease, but is due to a higher state of virulence which the streptococcus happens to possess at the time it enters the tissues, or which it can soon acquire when the tissues are suited to its development in a virulent shape. It has also been demonstrated that erysipelas cocci may enter the blood; but, as a rule, they are not found in this fluid.

The affected skin in erysipelas invariably contains great numbers of a characteristic streptococcus, which is always present also in the surrounding apparently sound skin to a distance of half an inch from the margin of disease. Other micro-organisms are also found in the older parts of the disease-patch. In very grave cases small numbers of the streptococcus can be found in the patient's blood. The streptococcus occurs in all abscesses, etc. Mërovitch (London Med. Recorder, Nov. 20, '88).

The same germ is found in cases of acute lymphangitis as in erysipelas, and acute lymphangitis is only another form of erysipelas. Verneuil and Clado (La Sem. Méd., Apr. 17, '89).

Swine erysipelas is due to a bacillus, and not to the streptococcus of Feh-

leisen. McFadyean (Jour. of Comparative Path. and Therap., Dec., '91).

Prognosis.—The prognosis of erysipelas is very uncertain. The mortality-rate is somewhat above 10 per cent. Much will depend upon the rapidity and intensity of the course of the infection, and upon the organs which may be secondarily invaded by the poison, or possibly a complication by which a septicæmia may exist. Young and otherwise healthy persons would offer a favorable prognosis, while those more depleted, and especially those recovering from a lingering disease, would offer less hope of recovery.

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In grave cases of erysipelas in newborn infants the prognosis is most unfavorable. Under these circumstances serum-therapy may be of great value. Dauchez (La France Méd., Nov. 12, '97).

Treatment.—**LOCAL.**—The multiplicity of remedies advocated for the treatment of erysipelas is the best proof that no specific exists to arrest this infection. Prevention, therefore, should be sought for. The greatest adherence to aseptic principles and in the subsequent dressings of the case will insure the impossibility of the wound's developing erysipelas. Should, however, a contaminated wound present itself with the developing disease, antiseptics must intelligently be applied to the particular case as our sheet-anchor. The various remedies advocated by different authors rest upon this principle, each only claiming his antiseptic to have given the best results. This is probably the case, because the particular author has had most experience in that special method. Of all the antiseptics, that which is commonly believed to have the most germicidal power is 1 to 1000 sublimate solution of

mercuric chloride, slightly acidified. The antiseptic must come in close proximity to the invading micro-organisms, in order that it should exert its destructive power. Any method which will facilitate this will fulfill the indications. I, therefore, believe, with Kunert, that multiple scarifications and incisions should be performed when possible in order to facilitate the direct absorption of the antiseptic solution, while we also advocate, with Riedel and Classen, the scarification of the advancing margins of the erysipelas, so as to cut the development across before the micro-organisms have had access to them and fill these developments with an antiseptic solution, and so destroy them as they advance. The parts are kept thoroughly irrigated with the cold solution. If the patient should have some idiosyncrasy against mercuric chloride, a 3- to 5-per-cent. solution of carbolic acid may be used with efficiency. In fact, all the antiseptics known to-day have been, in turn, advocated, and, possibly, may be used with benefit.

Erysipelas treated by hypodermic injections of corrosive sublimate in a 1 to 1000 solution, around the edge of the eruption at two millimetres from it and three centimetres from each other. The patch is then covered with bichloride-of-mercury cotton. After twelve hours the procedure is repeated. Large blisters form and the erysipelas heals. The raw places are healed up by boric-acid ointment or carron-oil. Ducray (*Viertel-jahrsschrift f. Derm. u. Syph.*, Mar. 3, '88).

In erysipelas, hot solution of bichloride of mercury (1 to 1000) gives a double action: emollient and antiseptic. Ortiz (*Revista de Med. y Cirujica Prac.*, July, '89).

Quinine should be administered in doses of 8 to 16 grains, in accordance with the temperature, 4-grain pills being given three or four times daily; so that the patient is kept constantly under the

influence of the drug. Over the affected surface is applied an ointment made up of

R Bichloride of mercury, 1 grain.

Lanolin,

Vaselin, of each, $\frac{1}{2}$ ounce.

Arnozan (*Archives de Méd. et de Pharm. Militaires*, No. 2, '94).

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Combination of camphor and carbolic acid in about equal parts preferred. It is antiseptic, but not escharotic. The skin must be thoroughly cleansed before its application, and it should be used thoroughly and frequently and ahead of the line of demarkation. Regular feeding at short intervals with highly-nutritious, but easily-digested, food is of importance. Frank Parsons Norbury (*Medical Fortnightly*, No. 8, p. 223, '98).

For erysipelas of the face and scalp ichthyol and vaselin, equal parts, form an excellent local application, placing over this absorbent cotton.

Thiol used with great success in the treatment of erysipelas. Moncorvo (*Satellite of the Annual*, Oct., '92).

In erysipelas localized in the pharynx, compresses of ice around the throat and painting with a solution of cocaine advised. G. Bäärnhielm (*Transactions of the Med. Society, Univ. of Upsala*, p. 488, '92).

Hypodermic injections of pilocarpine recommended in facial erysipelas. The drug must be administered until the physiological effects are produced. Pilocarpine is contra-indicated in affections of the heart. If the erysipelas appear as a complication, the treatment is absolutely without efficacy. Salinger (*Therap. Gaz.*, Mar. 15, '94).

Thirty-two cases of erysipelas of the face and other parts of the body treated with compresses saturated in absolute alcohol, with excellent results. To prevent evaporation the compresses must be covered with some impermeable material and should be changed every fifteen minutes, until all inflammation has subsided, two or three days being generally re-

quired. Langsdorff (*La Sem. Méd.*, Feb. 27, '95).

Ichthyol lauded, in ointment with an equal part of lard spread upon the diseased area and a little beyond. On the face no covering to be used; on the body paraffin-paper. Shadewitsch (*St. Petersburger med. Woch.*, Sept. 17, '88).

The affected parts should be painted morning and evening with collodion, to which ichthyol has been added in the strength of 10 per cent., the application being made so as to cover the healthy skin for an extent of three centimetres around the affected patch; the application is always made from healthy to diseased skin. In eighty cases in which the author has used this method it has not failed once. When the varnish comes away the skin is left in a healthy condition. No bad effects of the treatment have been observed. Victor Cebrian (*El Siglo Médico*, Dec. 17, '93).

Success depends upon very thorough rubbing of a strong ointment of ichthyol with vaselin or lanolin into the red area and into the adjoining healthy skin, covering the parts with a sheet of lint or the ordinary surgical dressing. Thomas (*Liverpool Medico-Chirur. Jour.*, July, '93).

Ichthyol found efficacious in every form of erysipelas, and is superior to other remedies. Zelewsky (*Universal Med. Journal*, Mar., '94).

Erysipelas can be aborted by means of ichthyol: Ichthyol 2½ drachms; flexible collodion, 1½ ounces, is applied every three hours, always commencing the application about one inch beyond the line of demarkation between the healthy and inflamed skin. The latter is an important feature of the treatment. W. H. Delrett (*St. Louis Med. and Surg. Jour.*, Aug., '95).

Literature of '96-'97-'98.

Painting the affected parts twice daily with vaselin, covering the application with linen, and fastening with a gauze bandage gives good results. In addition to this the treatment is purely symptomatic.

One hundred and thirty patients treated in this way show results equally

as good as those obtained by other methods. H. Koster (*Therap. Monats.* vi, 299, '96).

For a child from 1 to 2 years old the internal use of 4 drops of the tincture of the chloride of iron every three hours, either alone or with one of the preparations of cinchona advised. Externally an ointment of ichthyol, a drachm to the ounce of cold cream, should be applied. High temperature should be reduced by sponging, the wet pack, or the bath. J. Lewis Smith (*Pediatrics*, May 1, '96).

Severe case of erysipelas migrans complicated with gangrene of the eyelids and lips, besides nephritis, observed, in which brilliant results were obtained by the application of ichthyol. The remedy was used in the form of an ointment (1:3 or 1:1 with adeps lanæ or vaselin). W. J. Rosenberg (*Aerzt. Rundsh.*, vol. viii, p. 229, '98).

Iodol excellent as an abortive of facial erysipelas, as proved in 25 cases. The remedy dissolved in collodion and the 10-per-cent. solution painted over the affected part in thick layer extending a few centimetres beyond the limits of the erysipelas. Rapid cure effected in all cases. Lobit (*Bull. Gén. de Thérap.*, vol. cxxxv, p. 540, '98).

Hueter has recommended the parenchymatous injection of 2- or 3-per-cent. solution of carbolic acid at the margin of the inflamed district, particularly in the beginning of erysipelas. In cellulocutaneous erysipelas and cellulitis a series of incisions, each about two inches long, should be made in the inflamed cellulose tissue in order to prevent gangrene and give exit to the pus or discharges. These incisions are made where the skin seems to be most inflamed, in the direction of the long access of the limb, parallel with the blood-vessels, so that these should not be wounded. It may be necessary to give an anæsthetic to make these incisions.

GENERAL TREATMENT.—General treatment will essentially consist in feeding the patient and giving tonics, chief

among these will be the tincture of the chloride of iron in doses of 30 drops every two hours. This is supposed to have more of a specific action than any other drug recommended for the purpose. The value of Marmorek's serum has not as yet been established.

Rabbits may be immunized against the streptococcus by the injection of attenuated cultures into the peritoneum, and their serum possesses preventive and curative properties against erysipelas induced in the rabbit and natural erysipelas in man. D. Gornakowsky (*Annales de l'Institut Pasteur*, July, '95).

An antitoxin of streptococcic infection used in cases of erysipelas with success. The mortality before this was usually 5.12 per cent., while during the period of its use, in which 306 cases occurred, of which 165 were considered severe enough to be injected, the mortality fell to 1.63 per cent. Omitting certain cases with severe complications or associated conditions, the mortality was but 1.2 per cent. A weaker serum was then employed, and the mortality rose 4.82 per cent. When the dose was sufficient, improvement in the local and general symptoms took place in 5 to 12 hours and the temperature rapidly declined, becoming normal in 24 hours. If this did not occur, the dose was repeated. The dose varied from 10 to 20 cubic centimetres, and never exceeded 120 cubic centimetres in 10 days. Marmorek (*Annales de l'Inst. Pasteur*, Nov. 7, '95).

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Treatment of 501 cases of erysipelas by serum prepared by the Pasteur Institute, with a mortality of only 2.59 per cent. The ordinary dose of serum varies between 6 and 10 drachms. Chantemesse (*Med. Press and Circular*, Feb. 12, '96).

Marmorek's antistreptococcic-serum erysipelas is non-toxic, and has been used in newborn infants without any harm; it may be used in large doses. In erysipelas as soon as the diagnosis is made, 10 cubic centimetres of the serum are to be injected into the subcutaneous cellular tissue of the flank. Benign cases are

generally cured by one dose; if not, a second dose is injected after an interval of twenty-four hours. The temperature and the pulse are the guides to the need for repeating the dose. Two or three hours after the injection there is a rise of temperature, which rapidly falls again. M. Deléarde (*Nord. Méd.*, iii, 17, '96).

Of 145 cases treated systematically by the ordinary methods, 5 died; of 409 cases treated by systematic cold baths, 16 died; of 297 cases treated by a Marmorek serum of medium strength 5 died; and of 107 cases treated by a weak serum 7 died; of 97 cases treated by a strong serum but 1 died—the mortality being for cases not treated by serum 3.79 per cent., and for the serum-treatment, 2.59 per cent. After the injection the symptoms diminish markedly within a few hours, and disappear completely within a few days.

Albuminuria is never caused by the injections, and if it exists it disappears. Nevertheless, the treatment by aconitine is superior to that by the serum,—100 cases without fatal result. Gonion (*Lyon Méd.*, Feb. 23, '96).

Antistreptococcic serum for the treatment of erysipelas must be prepared from cultures of streptococcus erysipelatosus; and not from cultures of streptococcus pyogenes, as these two organisms are specifically different. Parascandolo (*Wiener klin. Woch.*, Nos. 38 and 39, '97).

The best diet will be milk, beef, tea, eggs, champagne, and beer.

The bowels should be regulated, and an anodyne given to induce sleep and relieve restlessness.

ERNEST LAPLACE,

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ERYTHEMA.

Definition.—Erythema as a generic name has been used to serve a complex or rather triple purpose. In itself the term simply denotes redness of the skin in which varying graduations of tint

from yellowish red to violaceous red, darkish red, bluish red, or even blackish red are observed. In size it may not involve a spot larger than a lentil, and again it may cover a limb or the greater portion of the trunk. It may assume a rounded, oval, or an irregular outline. As a significance of disease or disturbance of the functions of the skin it implies, on the one hand, only an hyperæmia or active inflammation. As these two forms are so likely to merge into each other, it is a difficult matter to determine just where the hyperæmia ends and the inflammation begins. This is a pathological rather than a clinical problem. Both of these forms have been usually placed in the class of inflammations, although recently Duhring, of Philadelphia, has placed the former in his class of hyperæmia, referring to them as "disorders characterized by the presence of an abnormal quantity of blood in the vessels supplying the skin, without the presence of inflammation." In this class is included erythema hyperæmicum, or simplex, and in the class caused by actual inflammation is included erythema exudativum, under which titles we will discuss them.

Simple Erythema.—In this form there is a discoloration of the skin, varying in tint, size, and shape, and due to an abnormal flux of blood to the tissues without the presence of inflammation.

SYMPTOMS.—The affection is transient, the coloring fading under pressure, and is caused by numerous internal and external agencies. It is instanced by the abnormal flushings and blushings which are the expression of the varied feelings, such as anger, joy, and shame; it is also produced by disturbances of digestion due to indigestible foods, alcohol, drugs, or by various external injuries, as, for instance, the action of heat

or cold, poisonous plants or drugs, or traumatism. The lesions produced vary from the slightest tint of red to a very dark color, and vary in shape from a round or oval to an irregular patch.

ERYTHEMA PUDORIS.—This form bears considerable analogy to the above, but it is the expression of menstrual disturbances, pregnancy, climatic influences, and general disorders. The difference between this and the foregoing variety lies in the cause. This latter affection is the result of some psychical influence, and usually progresses as the patient ages. Chronic blushers belong to this category.

Erythema Venenatum.—Certain mineral and vegetable substances also produce an erythema, but if the contact is prolonged actual inflammation takes place, and vesicles, pustules, or other symptoms may be observed. This form of erythema occupies the point of contact, and is manifested by a distinct, pinkish-red, irregular patch of small or large size, according to the amount of surface acted upon by the irritant. Mustard, cantharides, sulphur, strong soaps, ivy and other plants, acids, and many other drugs may be mentioned as some of the causes. This form of erythema usually persists for some time after the removal of the causative influence, and in cases in which the skin is delicate the most energetic treatment will be demanded.

Erythema Caloricum.—Both heat and cold may give rise to erythema. That induced by heat is diffuse, and, although its disappearance follows immediately upon the withdrawal of the causal factor, it may persist for some time in fair skins, to be, in turn, followed by some degree of desquamation. Exposure to the actinic rays of the sun is the usual and greatest exciting cause, although it is ob-

served in many persons who are obliged to work around stoves or machinery.

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Patient who suffered from a relapsing solar erythema on the backs of the hands. For six consecutive years this disease appeared at a time of the year during which it had first made its appearance; it involved the backs of the hands; the face, shaded by the hat, had escaped. The patient was an alcoholic; the liver was enlarged. Dreyfus (Province Méd., June 19, '98).

Cooks, stokers, and men or women who toast their shins before the open grate present gyrate patterns and annular patches of redness (*Erythema ab igne*, Crocker). This condition generally disappears without leaving any trace, but there are cases in which the causative influence is often repeated; some degree of pigmentation is induced and may persist for long periods, if it is ever at all removed. Hammer refers to certain cases in which the action of the sun's rays disappears immediately upon entrance indoors, and speaks of these cases as not being influenced by the heat of a fire, but as being observed in winter as well as in summer. Cold exerts a similar influence upon certain subjects and is shown by a livid, bluish, or cyanotic appearance at the point of contact. Exposed for long periods pigmentation may be observed, or the condition may terminate in inflammation or ulceration.

Erythema Traumaticum.—Violence of slight degree causes a diffuse redness at the point of contact, which may vary from a slight tinge of yellowish red to that of a dark red. Even under slight traumatism, if contact is allowed to continue, the condition will induce inflammation with all its consequent phenomena of vesicles, pustules, or bullous lesions. Complications may arise in the

form of a true dermatitis, eczema, or other form of irritation or ulceration, and permanent pigmentation follow.

The exciting agencies are numerous, and the degree of injury depends upon the actual cause. Ill-fitting wearing apparel or even bed-dressings, tight garters, shoes, trusses, and diapers are some of the factors most commonly met with, while fæces and salivary and leucorrhœal discharges may represent another class among causal conditions. Repeated attacks leave the point of affection prone to other affections; the most important of these is bed-sore, which occurs as the result of being too long in one position and thus inducing pressure upon one portion of the body, or lying upon rough and unclean bed linen. Certain occupations tend to the production of local erythema, as, for instance, in the case of persons who are obliged to remain seated for long periods, as shoemakers, or those who stand indefinitely, as clerks.

Erythema Neonatorum.—During the first week of life we sometimes meet with a diffuse universal redness; according to Elliot, this rarely extends beyond the seventh day. Beginning as a pale-red spot, it reaches its highest coloration about the third or fourth day, and then gradually fades, without leaving any desquamation. Elliot states that "during its involution, a yellow color, resembling that of icterus, may become apparent, and in very severe cases there may be petechia." The usual causal factor in its production is some form of external irritation, harsh manipulation, either with the hands or towel while bathing or dressing, and exposure to the atmosphere.

Erythema is a very common condition in the newborn and is characterized by great numbers of vesicles with a red areola; as these rupture they become fused. It is most frequently seen upon

the nates and posterior surface of the thighs, but may also be present upon the trunk and head. It is one of the accompaniments of athrepsia. Bland, absorbent powders should be used in its treatment, and if there is ulceration one may use applications of naphthalin, iodoform, or a 5-per-cent. solution of aseptol. Vineta-Bellaserra (*El Progreso Ginecol. y Ped.*, Sept. 25, '88).

Erythema Læve.—This term is applied to red patches apparently produced by œdematous conditions of the limbs. Impaired circulation is the probable cause. Swelling, redness, tensity, and a glossy or waxy appearance of the skin are the usual symptoms met with. Allowed to continue, these symptoms usually terminate in ulceration. *Erythema œdematosum* is applied when great œdema is present.

Erythema Simplex Symptomaticum.—Under this heading belong all the erythemas which are due to some internal derangement, whether of the intestinal canal or from some general disease of the system. In some instances the cause is the ingestion of some food which retards digestion; in others the general economy is disturbed by some drug, such as alcohol, phenacetin, or other substance. This form of erythema does not respect any portion of the body; it most frequently attacks the face, neck, and upper portion of the chest and back.

ERYTHEMA INFANTILIS.—*Erythema* in the infant results from derangements of digestion, teething, and a number of other affections to which young children are prone. It appears, for the most part, upon the face and trunk, although other surfaces are liable to be affected. It may vary from a rosy-red macule of diminutive size to a lesion circular or semicircular in form, or present multiform manifestations. It is rarely elevated, causes some itching, but usually disappears in a few days. It may be persistent

if its causes are not removed, and is sometimes followed by a slight desquamation.

ERYTHEMA MEDICAMENTOSUM.—The lesions produced by drugs internally administered upon the skin are manifold in character and may at times resemble many other diseases of the skin, but the fact that one of a series of eruption-producing drugs—such as the coal-tar derivatives, antipyrine, antifebrin, phenacetin, and others—as salicylic acid, quinine, and iodine—have been ingested will generally lead to a correct solution of the difficulty. (See *DERMATITIS* and the various drugs named.)

Number of cases observed in which an erythema of the face was developed from nasal insufflations of salol. Cartaz (*Med. Bulletin*, Aug., '91).

Case of facial erythema in a woman suffering from hypertrophic rhinitis following influenza, due to cocaine applied to the nasal mucous membrane. Castex (*Le Bull. Méd.*, May 24, '93).

An erythema may result from the local action of mercury. This may resemble the rash of measles or scarlet fever. O. Rosenthal (*Berliner klin. Woch.*, Nos. 23, 24, '95).

Hair-dyes may cause erythema; usually such forms are quickly over. Cathelineau (*Revue Internat. de Méd. et de Chir.*, April 10, '95).

Antipyrine in some persons provokes eruptions differing widely from the average type of drug eruptions. They begin by a sensation of pruritus, to which succeeds an inflammatory œdematous tumefaction. The usual localities of such eruptions are at the union of the skin and a mucous membrane. The fingers and the scrotum may be secondarily affected. Congestive œdema may be the only manifestation, but usually vesicles are formed. They burst rapidly on mucous membranes, slowly on the penis, and often not at all on the skin, where recovery occurs by drying up and desquamation, while in the mouth they give rise to ulcers covered with a fibrinous deposit. They cause no cicatrices and rarely any pigmentation. The affection

lasts from two to three weeks. Martin Brasch (Therap. Monats., Nov., Dec., '94).

Attention called to the indelible pigmented patches following antipyrine erythema. The pruritus is intense, the patches discrete and non-symmetrical, attacking the places where the clothes press the skin. The form is oval, with the long axis placed transversely. In the beginning the appearance is erysipelatos, changing to vesicular; then desquamative, when it becomes blackish; at last it becomes fawn-colored and remains so. Morel-Lavallée (Le Bull. Méd., vol. i, p. 392, '95).

Literature of '96-'97-'98.

Attention called to the peculiar state of the skin in which arterial blood sprinkled upon it causes irritation and sets up an erythema. Harrison (Brit. Jour. of Derm., p. 42, Jan., '97).

Several obscure cases of erythema in women. It began with tickling and pain in the skin; the hands were red on the dorsal surface and between the fingers. In severe cases the skin was considerably swelled and bullæ appeared. On the palpebra the erythema was quite erysipelatos, and ptosis often observed; a lamellous desquamation followed usually. The cause of the disease was found to be the *Primula acaulis* (common primrose), to which these women appeared very sensitive. In all the cases of erythema the primroses were kept in the rooms, and after removal of the plants the eruption disappeared. Actandor (Hospitalstidende, '97).

ANOMALOUS FORMS.—Under this heading may be included forms mentioned by Duhring as occurring in the course of asthma, rheumatism, gout, hemiplegia, chorea, epilepsy, exophthalmic goitre, and other toxic influences.

Erythematous and erythemato-papular eruptions observed in the course of blennorrhagia resemble those found in other infectious diseases, as pyæmia, etc. Dubreuilh (Annales de la Polyclin. de Bordeaux, July, '89).

Man, 26 years old, with decided neu-

rotic tendencies, who, during convalescence, displayed a polymorphous erythema. Peter (La Semaine Méd., July 15, '91).

Case of a man admitted to the hospital for unilateral rheumatism of the ankle and knee-joint. The following night an eruption suddenly manifested itself on the flexor and extensor surfaces of the arms, on the face, back, chest, and palms, but not on the backs of the hands. The patches were erythematous, pea-sized, ill-defined, and very numerous, and were itchy from the beginning. The eruption continued to spread over the general surface, and four days later attacked the mucous membrane of the pharynx. The rheumatic pains subsided after the efflorescence began to appear. General desquamation set in two weeks after the first appearance of the eruption, having been preceded by a change in the character of the lesions, the characteristic patches of erythema multiforme giving way to a generalized eruption of numerous minute, yellowish-gray, superficial vesicles, such as are met with in scarlatina. Large, exfoliative patches of skin were thrown off, with glove-like casts of the hands and feet, similar to the exfoliation of dermatitis exfoliativa. The duration of the whole disorder was about three weeks. Duhring (Jour. of Cut. and Genito-Urin. Dis., Nov., '91).

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A large proportion of the cases of erythema multiforme are associated with rheumatism, and can only be looked upon as results of the rheumatic poison. Stephen Mackenzie (Practitioner, Nov., '96).

This variety also includes the form observed during variola. It may be noticed about the second day of small-pox, and before the appearance of the specific eruption. According to Atkinson, of Baltimore, it generally spares the portions generally invaded by small-pox and rarely lasts more than twenty-four hours. The character of erythema observed is a diffuse redness, of a violaceous color, and

in size varies from a pin-head to a lima-bean.

Erythema vaccinum occurs during the course of vaccination. It may appear early, during the first two days, or may be delayed until the sixth or seventh, or at the time of beginning ulceration. Many patches of macules may be found over the body-surface, with here and there an isolated macule of a bright-red color.

But 2 cases of purpura and 14 cases of erythema in the course of 430 vaccinations. The erythema resembled the exanthem of measles. It developed in the course of from 24 to 72 hours, and persisted ordinarily for from 6 to 8 days. Epstein (Jahrbuch f. Kinderh. u. physische Erziehung, B. 35, p. 442, '93).

Erythema diphtheriticum is the form of disease observed in connection with diphtheria, in both mild and severe cases. (See DIPHTHERIA.) It appears sometimes as late as the second or third day of the diphtheritic process, and may occupy the trunk or extremities only, or may cover the greater portion of the body. The lesions are a diffuse redness of a mottled, punctate, or scarlatinal form, and when in patches it is generally located upon the thorax and abdomen, though frequently upon the extremities. According to A. R. Robinson, it does not usually increase in size after the first few hours and disappears during the next twenty-four or forty-eight hours without leaving any desquamation.

Erythema Choleraicum.—According to Duhring, there is an erythematous eruption observed in cholera patients. It occurs in polymorphous manifestations. These are usually macular, maculo-papular, or papular, and are noted upon the dorsal surfaces of both the hands and feet, forearms, legs, face, and trunk. It may appear either at the beginning or

termination of the disease and disappears in the form of a desquamation.

Erythema also occurs at times in *uræmia*, *Bright's disease*, and *jaundice*. According to both Le Cronier Lancaster and H. Pye-Smith, lesions are observed. In *uræmia* the lesions usually occur during the later stages of the disease and just shortly before the patient's death. They are at first erythematous, and in a few days become papular; fresh erythematous and papular lesions may afterward be observed at different stages of development over portions of the body. The lesions appear upon the extensor surfaces of the hands, forearms, and legs, and when numerous are noted upon all portions of the body, including the palms of the hands, soles of the feet, and mucous membranes, and are especially well developed upon the face. Upon the face they tend to become confluent and cause great disfiguration. They are bright red, and beyond a slight deepening of tint remain as noted for three or four days. They disappear either as flaky desquamations (often being as large as those noted in exfoliative dermatitis), hæmorrhages being noted in the papules either during or previous to this stage, leaving a red, brawny thickened skin; or it may become eczematous and terminate in the formation of crusts or in the formation of pustules and abscesses. Itching sometimes accompanies this condition.

Pathology of Simple Erythema.—The erythemas are the result of disorders of the vascular system and particularly those of the smaller vessels contained in the upper layers of the corium and which radiate from there to the strata of the epidermis. Hyperæmia is but an excess of blood propelled into the smaller capillaries through vasomotor origin. The hyperæmia differs with the character of

the exciting agency. Transitory hyperæmia caused by a slight injury generally fades quickly and no trace of its existence can afterward be determined, while those due to more marked lesions fade less quickly. Pressure leaves no visible change, though less pliability may be noticed. At first, in the active hyperæmias, the skin may be of a lighter hue, but in passive hyperæmia it becomes darker. Although the temperature is somewhat above that of the normal, it may not even affect or may even be slightly below that of the natural state.

Prognosis.—The prognosis of simple erythema is usually favorable. A slight hyperæmic process, unaccompanied by inflammation, quickly subsides, although some degree of pigmentation may remain to mark its site.

Treatment of Simple Erythema.—When the disorder is likely to disappear spontaneously, it is hardly necessary to advise any form of treatment, but in protracted cases, as well as those attended by recurrence, active measures should be resorted to. Errors of digestion require appropriate measures based upon the symptoms produced. Any intestinal irritant should be promptly removed by cathartics. In cases attended by tingling and burning or where a slight degree of exudation has taken place the application of some bland powder, simple lotion, or unguent will easily mend matters. Boric acid, either as a plain powder, in full or diluted strengths, a lotion in half or full saturated solutions, or as an ointment, $\frac{1}{2}$ drachm of boric acid to the ounce of ordinary petrolatum, will usually suffice. Lycopodium or fullers' earth will serve a similar purpose. At times it may be advisable to add a slight quantity of carbolic acid to procure early relief.

Erythema Scarlatiniforme.—Ery-

thema scarlatiniforme (named by Hardy), roseola scarlatiniforme (Bazin), or erythema scarlatinoides (Besnier), is an erythematous skin eruption closely resembling that observed in scarlatina, and from which affection it must be differentiated.

SYMPTOMS.—According to French dermatologists, there are two types of this affection. The one "érythème scarlatinoïde," an acute rash resembling either scarlatina or measles, and accompanied or not by desquamation; the other "érythème desquamatif scarlatiniforme récidivant," a subacute erythematous outbreak, resembling very closely scarlatina, usually accompanied by desquamation. As its name implies, it is a recurrent affection.

In the more acute type the lesions may be preceded, from a few hours or two or three days, by some constitutional disturbance, notably malaise, with chilly sensations and a rise of temperature of two or three degrees. The lesions, which are of a pinkish-red or crimson color, are punctate or diffuse and situated on the chest, thighs, face, neck, and other regions, although they are not particular to any region. At times there may be slight itching or burning. The duration varies from a few days to one or more weeks. Aggravated acute types may desquamate either as thin, flaky scales or in large-sized exfoliations. Observers refer to still another type in which the affection stimulates more particularly these characters of rubeola.

In addition to the general malaise, subacute cases are likely to present some disturbance of the renal functions and albuminuria. The lesions are rather more lasting and exist from periods varying from three to six weeks. When the eruption reaches its height there may be a lowering of the fever. A marked

symptom of this variety is the number of recurrences, while desquamation is a prominent character. Hartzell refers to the diminution of severity with each succeeding attack.

DIAGNOSIS.—Owing to the great resemblance of this affection to the rash of scarlatina, it is important that a close differentiation be obtained. The symptoms of the latter affection may present characters — such as the strawberry tongue, sore throat, great depression, and the presence of large or small quantities of albumin in the urine—which will usually be sufficient for all practical purposes. The early desquamation or the desquamation during the height of the fever will generally serve to establish the nature of the affection present.

ETIOLOGY.—It may be the expression of forms of stomachic disturbances, such as produced by the ingestion of toxic agents, as alcohol, antipyrine, belladonna, copaiba, arsenic, opium, the iodides, salicylates, or carbolic acid.

Interesting case in a middle-aged woman in which the ingestion of $1\frac{1}{2}$ grains of quinine was followed by the appearance of a scarlatinoid rash over the whole surface of the skin, accompanied by painful swelled throat. The symptoms, however, disappeared in a few hours. Glax (Lancet, Jan. 17, '91).

Typhoid fever, surgical operations, rheumatism, parturition, certain infectious affections, and sewer-gas poisoning (Crocker) are among the numerous conditions which may give rise to the disease.

Woman observed in whom an erythema having no relation to scarlatina followed each of three labors. Gärtig (Centralb. f. Gynäk., No. 30, '94).

PATHOLOGY.—Why so many different avenues should lead to the same result is difficult to determine. Idiosyncrasy may play a very important part in assisting its appearance. Brocq has advanced the

idea that the desquamative or subacute variety, as previously noted, is only a benign form of pityriasis rubra, but this theory has not obtained many followers.

PROGNOSIS.—Serious consequences are unlikely to follow if produced by some form of irritative ingesta. Elliot states that the affection “is grave and indicative of death when it appears in the course of a pyæmia, a septicæmia, or a puerperal peritonitis.” The relapses may be more or less numerous and a different cause may be ascertained in some cases for each recurrence.

TREATMENT.—The first indication is the removal of the inducing cause where possible. Should this be some form of irritative ingesta the use of catharsis may suffice. The local symptoms should be relieved by means of antipruritic or stimulating washes. Boric and carbolic acids are probably the best remedies of this class. It may be deemed advisable in many cases to use more active local measures. For this purpose some active drugs, such as menthol or thymol, may be used.

Erythema Induratum Scrofulosorum.

—This condition was first described by Bazin under the title “*érythème induré des scrofuleux*.” It is an affection that may be mistaken for erythema nodosum. It is found in those persons of strumous diathesis and especially women and young girls (Crocker) who are easily fatigued and who are obliged to remain for long periods in a standing position.

Literature of '96-'97-'98.

Erythema peculiar to lymphatic or scrofulous young girls who are obliged to remain much of the time in an upright position. It is to be considered as a scrofulo-tubercular gumma developed in the subcutaneous tissue of the lower limbs, and associated with congestion of the skin in the neighborhood as a result of the venous stasis to which the local-

ization of the affection in these limbs is due. G. Thibierge (Med. Week., Paris, Jan. 17, '96).

It generally presents itself upon the anterior surface of the legs and occasionally upon the calf (Crocker); the lesions may be deep-seated nodes or nodules, which are either absorbed or break down into suppurating ulcers. In color they are first of a bright red, but they soon become darker or of a livid tint. After breaking they are observed to be punched out, round or irregularly oval ulcerations which resemble to a marked extent gummatous lesions.

Erythema induratum (Bazin's disease) is a manifestation of scrofula occurring mostly in young women, in which multiple ulcers, the consequence of a subcutaneous and self-infective inflammation, occur on the legs, such ulcers being difficult of cure, prone to relapse, and presenting appearances very likely to be mistaken for syphilis. Hutchinson (Archives of Surg., Oct., '93).

In differentiating the early characters from erythema nodosum the acute and shorter course observed in the latter affection is to be noted.

Literature of '96-'97-'98.

Histological and bacteriological survey of the lesions of erythema induratum of Bazin, showing that there is nothing to authorize us to attach it directly to tuberculosis. The histological appearances seem to be due to fatty degeneration, which develops ulterioresly on regions affected with a considerable and spontaneous œdema. The inflammatory signs are there reduced to a minimum. The erythema induratum of Bazin is but a chronic, and occasionally ulcerative, variety of erythema nodosum. Audry (Ann. de Dermat. et de Syph., Mar., '98).

Diagnosis from syphilitic gumma is established by its longer duration before the occurrence of ulceration, and the serpiginous outline of the latter, or the presence of scars.

Erythema Exudativum Multiforme.—

Erythema exudativum multiforme is an acute inflammatory and exudative affection of the skin, characterized by the appearance of macules, papules, or vesicles, discrete or confluent, and of varying sizes and configurations.

SYMPTOMS.—The character of lesion observed, with its many configurations, has given rise to the use of certain terms which are indicative of the condition present. Erythema multiforme papulosum is used when the predominating lesion is of the papular type. Erythema multiforme tuberculosum when the size of lesion is slightly greater than the papule; erythema multiforme vesiculosum when of the vesicular type; erythema multiforme bullosum when bullous; erythema multiforme annulare seu circinatum when it assumes an annular or rounded form; erythema multiforme figuratum seu gyratum when peculiar irregular lesions are formed from a coalescence of two or more annular or circinate rings; erythema multiforme iris when new lesions appear successively in the clearing centre of the preceding manifestation; erythema multiforme vesiculosum circinatum (herpes circinatus) when the borders of a papule are covered with a ring of vesicles; erythema multiforme vesiculosum iris (herpes iris) when several concentric rings of vesicles are formed; erythema multiforme urticatum (lichen urticatus) when from the œdema they closely resemble urticaria.

Erythema exudativum multiforme has points of predilection. For the most part lesions are observed upon the backs of the hands and feet, the forearms, and the legs. Next in frequency they occur upon the region of the head, the cheeks and neck, and lastly upon the trunk, the chest and back, and the abdomen. In aggravated cases, or in those unusual

types, the lesions may be observed in other parts of the surface. They are usually first noted upon the hands and fingers, and from these regions spread to other parts, and result in some cases (as recorded by Duhring) to an enormous involvement of the whole general surface.

Death has been observed by Vidal and Leloir, and Molenes-Mahon speaks of a number in which death also occurred.

DIAGNOSIS.—The fact that death can occur from this affection renders an exact diagnosis of especial importance.

Eczema.—In papular eczema we may notice a symmetrical arrangement, but usually the lesions are regular as to size and outline. They may retain their appearance, but are prone to become either vesicles or pustules. Their duration is rather more lengthened, and crusting is likely to result from the excessive exudation.

Psoriasis.—Psoriasis is not likely to assume a symmetrical arrangement. It is more likely to be covered with decided desquamations and to be of much longer duration.

Tinea Circinata.—Circinate ringworm is not usually symmetrical, is slower in its extension, and more persistent in its character. The edges in this affection are usually well defined.

Syphilis.—Careful examination should be sufficient to make a correct diagnosis. The papular, and other varieties, will usually give some distinct sign of the syphilitic contamination.

Urticaria.—The lesions of urticaria are mostly uniform and of a white color, usually of short duration (rather evanescent) and are not likely to present different stages.

Pemphigus.—The lesions of pemphigus are bullous, always remain so, and depart as such, while they appear rapidly

and are asymmetrical; they are not accompanied with much inflammation.

Dermatitis Herpetiformis.—In this affection the lesions are multiform (erythematous, vesicular, bullous, or pustular), are not symmetrical, and usually run a chronic course.

Erythema Nodosum.—The lesions are deep seated and nodular, are usually observed upon the lower extremities (along the tibia), do not change in appearance, and are painful (almost rheumataform) at all times.

Literature of '96-'97-'98.

Erythema exudativum multiforme is a well-characterized, and independent disease, to be distinguished from other erythemata produced by infectious disease. The disease is especially to be distinguished from *erythema nodosum*, and is quite independent of gout or rheumatism. The morbid phenomena are inflammatory in nature, and are caused by the local irritative effects of certain infective materials. Veiel (*Practitioner*, Nov., '96).

ETIOLOGY.—The cause or causes of this affection are obscure. It presents a tendency to recur at certain seasons of the year (usually the spring and fall), and is probably influenced by climatic changes.

Erythema multiforme regarded as a catarrhal disease. By this is meant that the same causes which produced catarrhs in people with susceptible mucous membranes produced this eruption in those with susceptible skins. Hutchinson (*Clinical Jour.*, Nov. 6, '95).

Numerous cases are recorded in which the affection recurred at regular intervals, as, for instance, every year at the same time, every three months, at intervals of six or more months, or at longer stated intervals. All ages are affected, and the disease seems to more greatly attack young children and young females.

There is no doubt but that certain affections predispose to its appearance; thus rheumatism, gout, uræmia, Bright's disease, jaundice, diphtheria, and cholera.

Cases of erythema multiforme described where, owing to faulty processes in the digestive tract, the production and absorption of toxins were possible. Examination of the urine and fæces disclosed a large excess of indol, skatol, indoxyl, and skatoxyl, as well as phenols and organic compounds of sulphuric acid. Disinfection by calomel was followed by very rapid cure. E. Freund (Amer. Medico-Surg. Bull., Apr. 25, '94).

Literature of '96-'97-'98.

Under the designation toxic erythema attention called to a form of erythema occurring in the course of pus-formation. It is most commonly encountered in young children. Its form is usually macular or punctate, though occasionally of the papular or vesicular variety, and its course mild and of short duration, accompanied by moderate rigors, with rise of temperature, and subsequent desquamation.

The common form of small discrete macules of faint pink color, appearing first upon the abdomen and sides of the chest, few in number and widely distributed, are seen in the milder forms of endocarditis and empyema, tubercular abscesses, etc. In some cases of abscess of the middle ear or of mastoid this form is seen; but usually attendant upon these conditions we find the macular eruption rapidly changing to a papular, and in the severer cases to a vesicular form, with rigors of moderate severity, headache and backache at the beginning, followed by rise of temperature. These symptoms may follow an infected wound, accidental or intentional (as in vaccination), where there is rapid formation of pus and absorption of the toxic products of the same. The erythema is only a part of the general process, representing the action of toxins on the vasomotor centre. Cuthbert R. Barham (Med. News, Mar. 28, '96).

Certain drugs taken internally may

alike be mentioned as a possible influence.

PATHOLOGY.—Erythema multiforme begins essentially as an hyperæmia, and is quickly converted into an exudative inflammatory disorder. It can hardly be classed as an essential and specific disease, a fact which some authors claim, if we can really believe that so many diverse conditions will produce it. There is no doubt but that we have in the process an angioneurotic element as claimed by Schwimmer, Lewin, and Auspitz. Many others have observed micro-organisms in the blood and lesions.

PROGNOSIS.—All cases tend to rapid recovery, although a number of relapses may occur. Deaths have been recorded, but when the large number of cases is taken into consideration this loss of life is very small.

TREATMENT.—Internal treatment is to be directed toward the removal of the exciting cause where possible. All irregularities of the viscera are to be remedied. Rheumatic diathesis must receive attention, and iodide of potassium, recommended by Villemin, may be found of good service, 15 to 30 grains, thrice daily, as an absorbent in the vesicular and bullous form. Elliot says that it may, if given injudiciously, provoke an aggravation of existing conditions. In this class of cases Atkinson, of Baltimore, relies upon salicylic acid and the salicylates. I have frequently obtained excellent results with arsenous acid given during and between attacks.

Quinine is certainly demanded in those types which are presumably the effect of malaria. Antistrumous remedies—such as codliver-oil, phosphorus, and possibly strychnine—in those debilitated by such processes are valuable in the tubercular forms.

Local measures, while possibly di-

rected alone to the relief of subjective symptoms, may also be found beneficial. Boric acid is of distinct value in this affection, and applied in a saturated watery solution gives almost instant relief from the itching and burning that is occasionally observed.

The sulphite or hyposulphite of sodium may often be used advantageously in the strength of from $\frac{1}{2}$ to 1 drachm to the ounce of water. Ichthyol may be found of service in the vesicular and bullous types. At times stimulating remedies may act efficaciously, especially salicylic acid, carbolic acid, sulphurous acid, and hydrocyanic acid in varying strengths of solution.

In the urticarial type antipruritic lotions may be demanded. Mild cases may not require treatment, the subjective symptoms being very slight.

Erythema Nodosum.—Erythema nodosum is an acute inflammatory affection of the skin, characterized by the appearance of symmetrical, elevated, variously sized, shaped, and colored nodular formations, accompanied by constitutional disturbance.

SYMPTOMS.—Preceding the appearance of the lesions of an erythema nodosum there is usually general constitutional disturbance. Chills, with an elevation of temperature, or myalgic or rheumatic pains may be encountered. According to Duhring, œdema may be one of the first symptoms, while visceral involvement—with, later on, lesions of the heart and kidneys—may be present. For the most part, the nodes are localized upon the anterior surface of the shins, along the line of the tibiæ, and are arranged symmetrically. They are also observed, in exceptional instances, upon other parts, the arms and face, and I have recently observed a case in which the lesions were situated upon the chest,

along the line of the ribs, and upon the abdomen. Pospelow, quoted by Elliot, noted similar involvement of the mucous membranes of the mouth. These nodes appear rather suddenly, developing rapidly, and are of a light or rosy red color, but later become darker in appearance, of a bluish or of a purplish tint. Appearing either singly (usually) or in crops, the process may extend over a period of from one to five weeks (or longer), although each individual lesion lasts only about six or eight days. While disappearing they assume various colors, from a yellow to blue or purple, and closely resemble a bruise. During their height they have a tense and shiny look, and give to the touch an indistinct impression of containing fluid. They rarely suppurate, absorption generally taking place, although this result has been observed by Haisholt and others. Dilatation of the capillaries has been observed by Lewin and Unna, while Van Harlingen has noted lymphatic involvement. Hæmorrhage has, according to Demme, been observed in a case in which gangrene also took place. They are always painful and at first are firm to the touch, although they soon become softer, as they are disappearing. Some authors have described an ominous form of the affection in which tuberculosis is noted. Occasionally erythema nodosum and erythema multiforme are co-existent, especially that variety of erythema multiforme in which papules are the predominating manifestation.

DIAGNOSIS.—While with a careful survey of the lesions presented, as well as the concomitant phenomena, little cause may exist for error in diagnosing erythema nodosum, some instances do occur in which difficulty may be experienced.

Contusions are likely to be single and do not present those deep nodular forma-

tions. The cause can generally be determined.

Syphilis.—The syphilitic gummata, especially the non-ulcerating variety, which often resemble erythema nodosum, are sharply defined, indolent, and occasion no pain.

Literature of '96-'97-'98.

Erythema nodosum, a variety of polymorphous erythema, occurs frequently in the course of known infectious maladies as a secondary affection. Primary erythema nodosum results probably from a latent infection.

Cutaneous manifestations, reproducing with absolute fidelity the clinical type of erythema nodosum, are met with in the course of syphilis. This erythema may be due to a coincidence, and may result from some infection superadded to syphilis; but it is most frequently determined by syphilis itself.

There exists between syphilitic erythema nodosum and gummata of the skin and subcutaneous tissues a series of intermediate affections producing between these two kinds of lesions an insensible transition, and showing that between these two clinical types there is only a difference in intensity in the anatomo-pathological process. Beurmann and Claude (*Annales de Derm. et de Syphil.*, No. 4, '96).

Erysipelas generally presents a hard, though diffuse, inflammation, instead of a more circumscribed character of swelling.

Erythema Induré des Scrofuleux is not painful, is asymmetrical, of longer duration, and tends to ulceration; occurs in scrofulous subjects.

ETIOLOGY.—Erythema nodosum is an affection of early life, although instances in which it has affected varying ages have been recorded. Out of a total of 108 cases, S. Mackenzie found 14 under 10 years of age, 69 between 10 and 30, 15 between 30 and 40 years, and 10 over 40 years of age. Comby has presumably re-

corded the youngest, 14 months old. Most authors consider that the spring and autumn contribute the greatest number. Rheumatism accompanied many cases. Malaria was found to be a possible exciting cause by Boicesco.

Severe form of erythema nodosum occurring in five children, three of one family, suggesting contagion. In two cases several of the nodules became gangrenous. In spite of the rapid exhaustion attending these cases they all recovered. No bacteria were discovered in the blood, but in the tissue-fluids of the intact nodules, in the bullæ, pustules, and gangrenous patches, micrococci and bacilli were found. Pure cultures of the bacilli, when inoculated upon the abdominal skin of guinea-pigs, produced an eruption of erythematous lumps followed by gangrene. Inoculation of the micrococci produced no result. Demme (*Fortschritte der Med.*, No. 7, '88).

Four cases of erythema nodosum seen appeared to have been conveyed by contagion. Lannois (*Annales de Derm. et de Syph.*, p. 585, '92).

The nodular form of iodic eruption described in a woman where the lesions reached the size of the fist upon a paralyzed limb, but vascular changes probably accounted for the exaggerated size. Fordyce (*Montreal Med. Jour.*, Nov., '95).

PATHOLOGY.—Erythema nodosum is due to an inflammatory process, at first active and later passive. Atkinson, of Baltimore, argues that it is an overcrowding of blood- and lymph-vascular spaces and exudation of blood-cells, both white and red. The process affects the entire skin, and is believed by Kaposi to be a more fully-developed and stable urticarial wheal.

PROGNOSIS.—The prognosis is usually favorable. Relapses may occur or the process may be extended by successive outbreaks of new lesions. The usual length of each attack is from one to five

weeks, although the individual lesions usually run their course in from six to eight days. Death has been recorded, but this is exceptionally rare.

TREATMENT.—The disease tends spontaneously toward recovery, and it is very highly probable that constitutional measures exert little influence. General disturbances of the constitution require appropriate attention. A bland diet should be advocated and rest in bed advised. Iron, quinine, phosphorus, acetanilid, and phenacetin are often beneficial. To reduce inflammation, relieve pain, and prevent complications, a solution of sulphite or the hyposulphite of sodium in water, 1 drachm of either to the ounce, will be found useful. Ichthyol has also been of service in many hands (1 drachm to the pint of water). Carbolic acid, sulphurous-acid solutions, lead-water and laudanum, boric acid, and hot fomentations may also be mentioned as useful remedies when the others mentioned fail.

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ERYTHROXYLON COCA AND COCAINE.

Erythroxyton coca is a small tree that grows wild in Peru, Bolivia, Brazil, and Ecuador. The leaf, which contains the active principles, is the part used in medicine. Three alkaloids, hygrine, eegonine, and cocaine have been isolated from the cocoa-leaves. Cocaine, the only one that has been found useful in medicine, occurs in colorless, transparent crystals, which are soluble in alcohol, ether, chloroform, and fats. Cocaine forms salts with the acids, the hydrochlorate being official and the one usually used. The salts cannot be used for making ointments, as they are soluble in fats.

Preparation and Dose.—Coca (leaves), $\frac{1}{2}$ to 1 drachm.

Extractum cocæ fluidum, $\frac{1}{2}$ to 2 drachms.

Cocaine carbolate, $\frac{1}{12}$ to $\frac{1}{6}$ grain.

Cocaine hydrochloras, $\frac{1}{4}$ to 2 grains.

Coca is best administered either as a tonic or coca, such as vin Mariani, or in the form of the fluid extract. When administering coca or cocaine the possibility of intolerance on the part of the patient should be borne in mind and the danger of inducing the cocaine habit remembered. Solutions of cocaine hydrochlorate are bitter, and provoke transient insensibility of the tongue. Aqueous solutions do not keep well, but decompose in a short time and lose their efficiency.

Physiological Action.—When taken internally, coca and its alkaloid produce a sensation of exhilaration and pleasure similar to that produced by a large dose of caffeine. There is a marked tendency to wakefulness, a feeling of increased mental and muscular strength and vigor, and an absence of hunger. The brain is stimulated, but the sensory nerves are not generally affected, and, if at all, the effect is very feeble and is due to an influence on the spinal cord (Mosso). When applied locally to the sensory nerves cocaine paralyzes them. This also happens if the internal dose be very large. The effect upon the muscles when taken internally is direct stimulation, most marked after fatigue.

Maurel, of Toulouse, has shown that under the influence of cocaine the leucocytes undergo changes; they become spherical and rigid, increase in size, and no longer adhere to the vessel-walls. On the other hand, the capillaries contract, and thrombosis and embolism—particularly pulmonary embolism—may be produced.

Upon the heart and circulation cocaine in moderate amounts acts as a stimulant, the heart-beats being increased in number and force; but marked effects only follow a poisonous dose. Cocaine is a respiratory stimulant, large doses increasing the number of respirations; in poisonous doses it kills by failure of respiration associated with exhaustion from the accompanying convulsions (Hare). Cocaine increases body-heat to a marked degree if given in overdose, this rise being due to increase of heat-production (Reichert). When applied locally to mucous membranes, cocaine produces an anæsthetic effect, accompanied with a blanching of the membrane, followed by a marked congestion. When injected beneath the skin cocaine produces a local-anæsthetic effect. Applied externally to the skin it produces little effect.

Poisoning by Cocaine. — **ACUTE POISONING.**—When cocaine is given in poisonous doses the symptoms noticed are an exaggerated sense of mental and physical well-being, loquacity and mental incoherence, profuse diaphoresis, fall of temperature; shallow, irregular breathing; dilated pupils, disturbed vision, nausea, feeble pulse, and finally collapse.

Epileptiform convulsions have also been noted with disordered circulation and respiration; the convulsions, both tonic and clonic in type, are of cerebral origin.

Although the author has never had any serious accident result from the use of cocaine, he has noticed many times that patients under its use became garrulous and excitable, while the heart became rapid and somewhat weak. Cocaine is certainly a valuable drug, but by no means one to be carelessly or indiscriminately used. A. L. Benedict (Amer. Medico-Surg. Bull., Oct. 15, '94).

Danger of cocaine lies in presence of

secondary or amorphous alkaloids. Editorial (Pacific Rec. of Med. and Surg., Aug. 15, '95).

Literature of '96-'97-'98.

Case of cocaine poisoning observed in which the total amount of cocaine hydrochlorate injected hypodermically was about 14 grains. Recovery was uninterrupted and no after ill effects. Extreme collapse, absence of convulsions and unconsciousness, and conjunction of perspiration and polyuria were striking features of this case. J. O. W. Barratt (N. Y. Med. Jour., Apr. 25, '96).

Smallest hypodermic dose observed to produce faintness and nausea was $\frac{1}{10}$ grain: in the case of a man aged 65. Old people are especially susceptible, and it is advisable in every case to have brandy and amyl-nitrite at hand. J. Jackson Clarke (Lancet, Jan. 18, '96).

Case of cocaine poisoning observed in which, first, the nerves to the motor-oculi muscles were affected; secondly, the vagus; and after this the nerves to the mucous surfaces and skin. H. B. Palmer (Lancet, Mar. 12, '97).

Thus we have two phases of acute poisoning; one with symptoms of depression, the other convulsive in type.

CHRONIC POISONING. — Chronic poisoning by cocaine, or the "cocaine habit," occurs sometimes alone, sometimes associated with the opium habit. The symptoms after cocaine habit consist of marked loss of body-weight, disordered circulation, loss of mental power and moral perception, and delusion, similar to those affecting the subjects of chronic alcoholism. (See COCAINOMANIA, volume ii.)

Treatment of Cocaine Poisoning. — The treatment of acute poisoning where the symptoms are those of depression consists in the exhibition of sal volatile, coffee, strychnine, caffeine, digitalis, ether, and alcohol. If the symptoms are of the convulsive type, the treatment should be the same as that of strychnine

poisoning: inhalations of amyl-nitrite, bromides with chloral; if convulsions prevent swallowing, use chloroform anæsthesia and give antidotes by rectum in starch-water. Amyl-nitrite and morphine by hypodermic injection are indicated if relaxation does not occur.

Literature of '96-'97-'98.

From experiments upon animals in regard to lavage of organism in acute cocaine poisoning, the following deductions made:—

1. While the minimum fatal dose of cocaine muriate administered hypodermically is 0.025 gramme per kilogramme, one can inject, of the same drug, without fatal result: (a) gramme 0.03, if we follow the said injection with hypodermoclysis; (b) and 0.035 gr. per kilogramme if we follow the said injection with lavage of the organism by the injection of the physiological solution of sodium chloride.

2. While the minimum fatal dose of cocaine muriate administered fasting by the alimentary canal is $3\frac{1}{2}$ centigrammes per kilogramme, one can, with lavage of the organism, administer as much as $5\frac{1}{2}$ centigrammes per kilogramme without fatal result. Carlo Bozza (*Gior. Internaz. delle Sci. Med.*, Feb., '98).

Therapeutics.—The therapeutics of this drug may be conveniently treated under three heads: the internal, hypodermic, and topical administrations. Coca and cocaine are contra-indicated in fatty heart, arterial atheroma, pernicious anæmia, hysteria, and epilepsy.

The first and greatest precaution to be taken before the hypodermic injection is the preliminary physical examination; this should be made with the utmost thoroughness; if the patient is suffering with organic disease of the brain, heart, lungs, or kidneys, or any confirmed neurotic disorder, injection of the drug must not be attempted. The patient should be placed in a recumbent position, with the head low, and he should

not be allowed to rise for at least fifteen minutes after the cocaine has entered the general circulation. Where it is possible to use constriction, it should never be omitted. After the operation, tourniquet is loosened and immediately tightened. This is repeated at intervals of a few minutes until the cocaine has probably all entered the circulation. C. A. Dunmore (*Codex Medicus*, Dec., '95).

Literature of '96-'97-'98.

Cocaine administration in medical practice can be rendered absolutely safe by refusing its use in persons with kidney and heart affections, and the employment of means which will fortify against the possible occurrence of accidents. Accidents can be avoided by the administration of morphine and atropine. Oxygen-gas is the only true antidote. Charles Wilson Ingraham (*Med. News*, Jan. 22, '96).

Internal Administration.—For internal administration the fluid extract of coca or a good coca-wine, such as *vin Mariani*, is preferred. The elixir and tincture are not sufficiently active or reliable.

Literature of '96-'97-'98.

Cocaine successfully used in several cases of seasickness. A cathartic was first administered, then 5 minims of a 4-per-cent. solution of cocaine repeated every hour or two until three doses were taken. A. D. Rockwell (*Med. Record*, Apr. 1, '96).

FEVER.—The stimulating and supporting effects of coca are well known and may be utilized in all forms of low fever. In yellow fever it is of especial value on account of its anti-emetic property.

VOMITING OF PREGNANCY.—Coca has been found useful in many cases of this distressing malady and in other forms of vomiting. From $\frac{1}{2}$ to 1 wineglassful of *vin Mariani* or 1 to 2 tablespoonfuls of the fluid extract may be taken three or

four times daily, preferably after meals, so as not to impair the appetite.

FATIGUE.—In persons suffering from fatigue, coca is found to rest and freshen the mental and physical powers, giving a feeling of comfort and well-being, and making possible the endurance of further work and strain. To those who are about to undergo unusual strain or fatigue, coca acts as a powerful stimulant. Overindulgence in this use of coca is strongly advised against, in view of the danger of forming the habit.

OPIUM HABIT.—Coca has been employed as a stimulant during the withdrawal of the opium, but its use is not without the danger that the one habit may be replaced by the other, or, indeed, become associated with it.

Literature of '96-'97-'98.

In any case of opium poisoning an emetic should be first employed; then hypodermically $\frac{1}{4}$ to $\frac{1}{2}$ grain of cocaine. If after twenty minutes no decided effect has been obtained, another injection of $\frac{1}{4}$ grain should be given. Three separate doses of $\frac{1}{4}$ grain each, at intervals of twenty minutes, is the best plan to follow. During this time coffee by mouth or rectum to be administered. J. W. Stickler (*Langsdale's Lancet; Med. and Surg. Reporter*, May 28, '97).

PYLORIC CARCINOMA.—Cocaine carbolate has been used with success in these and other cases where a combination of an anæsthetic and antiseptic was desired. The dose used was $\frac{1}{12}$ to $\frac{1}{6}$ grain in wine or diluted.

NERVOUS DISORDERS.—In melancholia and neurasthenia coca has been used with advantage, especially when associated with a moderately-anæmic condition, a feeling of depression, loss of appetite, and impaired digestion, other appropriate remedies being associated with it. A wineglassful of coca-wine

every three hours usually brings about a beneficial change in a day or two.

Hypodermic Administration.—For hypodermic use the salts of cocaine are used (generally the hydrochlorate), as the alkaloid requires 1300 parts of water for its solution. A 4- to 8-per-cent. solution is generally employed, and not more than $\frac{1}{4}$ grain of cocaine should be injected.

Literature of '96-'97-'98.

Solution employed by writer contains 10 per cent. of resorcin and 20 per cent. of the hydrochlorate of cocaine. The addition of resorcin diminishes the toxic effect of cocaine, while at the same time it increases the anæsthetic effect of the latter, and it moreover prevents the cocaine's crystallizing out. The antiseptic properties of resorcin in the solution are also of value. Use of the spray for applying cocaine to the nose disapproved of. If after the application of a solution of cocaine the patient becomes pale, giddy, or faint, 1 drachm of the aromatic spirit of ammonia, in 2 ounces of water, should be given, and the patient directed to sip the draught. F. de H. Hall (*Brit. Med. Jour.*, Feb. 8, '96).

Extra care should be observed and a smaller dose given where injections are made about the head, face, and neck. The hypodermic use of cocaine is employed to relieve pain, and to induce local anæsthesia for the purpose of making some surgical operation.

NEURALGIA.—Sciatica, pleurodynia, etc., and all forms of muscular rheumatism are best treated by hypodermic injection. For all, except neuralgia of the head and face, $\frac{1}{4}$ to $\frac{1}{2}$ grain should be injected over the seat of the pain; for the two latter, the injection should be made into the arm.

Literature of '96-'97-'98.

In lumbago, sciatica, pleurodynias, all forms of muscular rheumatism, $\frac{1}{4}$ to $\frac{1}{2}$ grain of cocaine injected over the seat

of pain followed by excellent results. In neuralgia of head and face injection should be into arm. Injections continued as long as the pain lasts. G. H. Seagrave (Brit. Med. Jour., Feb. 8, '96).

The result is marked in nearly all cases. The pain disappears almost entirely for several hours, when, if it return, it is in a milder form. Injections should be continued as long as the pain lasts.

Cocaine anæsthesia is contra-indicated in all irregular and all great operations, as well as in abdominal surgery. Its principal use is in weakened subjects affected by organic taints or otherwise. The cocaine should not be allowed to enter the general circulation.

Local Anæsthesia.—Several methods of producing local anæsthesia by the hypodermic use of cocaine have been suggested other than the simple one employed in medication with other remedies.

The painless method is one in which, after the part to be injected has been subjected to antiseptic cleansing, the part is sprayed with rhigolene or ethyl-chloride until insensibility to pain is induced. The point of the needle is introduced just below the epidermis and a drop or two injected into the tissues. This produces an area of insensibility within the edges of which other injections are made, gradually increasing the extent of the area of insensibility. Corning, who suggests this method, advises the injection of the subepidermal region first, and subsequently the deeper tissues.

The endermic method consists in first producing a small blister, withdrawing the serum therefrom with a syringe, and replacing it with a solution of cocaine. This method has no practical value in surgery.

PROLONGATION OF LOCAL ACTION OF COCAINE FOR SURGICAL PURPOSE.—By arresting the arterial and venous circu-

lation, Corning has demonstrated that when cocaine is injected into an extremity its action may be prolonged for ninety minutes, if necessary. This arrest he accomplishes by the aid of appropriate ligature about the limb, or in the case of the breast or back by the application of rings, clamps, etc. He maps out the veins (to avoid puncture) by tying a piece of elastic webbing above the field of operation. As the veins become swelled he traces their course with a colored pencil and then removes the webbing. The limb is next exsanguinated with an ordinary Esmarch bandage carried up to (but not beyond) the field of operation and maintained in place till the injections of the anæsthetic are completed. A strong flat tourniquet is then applied about the limb *above* the field of operation and drawn tight enough to interrupt the circulation in the vessels. The Esmarch bandage is then removed, and the field is ready for operation.

Literature of '96-'97-'98.

Case in which Esmarch's constrictor was applied immediately above the malleoli; a solution of cocaine (1 per cent.) was then injected in the position of the different nerve-trunks, a number of different punctures being made with the needle. After an interval of three-fourths of an hour, the operation took place; this consisted in the removal of the great toe, its metatarsal bone, and of the cuneiforms, in addition to scraping with the sharp spoon and stitching of the skin. During the hour employed in these procedures, the patient was quite unaware of their progress. It is essential, in all cases in which it is desired to completely anæsthetize the hand or foot, that the rubber tourniquet be very firmly applied, and that a sufficient interval (not less than twenty minutes) be allowed to elapse between the injection of the cocaine and the operation. Otto Manz (Centralb. f. Chir., Feb. 19, '98).

THERAPEUTIC THROMBOSIS.—This is a method also devised by Corning for the localization and prolongation of the action of cocaine. Four principles are embodied in the procedure:—

1. Injection of the anæsthetic (cocaine) into the skin.

2. The subsequent introduction through the same hypodermic needle, and without its removal from the part, of a non-irritant oil (cocoa-butter).

3. Precipitation of this oil, after its injection into the skin, by the aid of moderate cold, but without freezing the tissues.

4. Taking up the slack of the skin near the seat of the injection, should the integument be very elastic. By the application of these principles he has succeeded in maintaining a limited zone of anæsthesia for considerably over an hour.

INFILTRATION ANÆSTHESIA.—This method of local anæsthesia was devised by Scheich, of Berlin, and employed by him in all kinds of operations, including laparotomy. He uses a weak solution of cocaine (1 to 1000), the solvent being a saline solution (of 0.2- to 0.3-per-cent. sodium chloride). A small spot on the skin near the field of operation is sprayed with ethyl-chloride, and when insensible to pain is injected with a few drops of the cocaine solution. At the spot of infiltration a wheal immediately arises, which is absolutely without sensation. Pushing the point of the syringe farther under the skin through this area of insensibility a few drops are again injected.

Another wheal rises close to the first, and by extending these injections farther and farther round the field of operation, the whole is infiltrated and rendered anæsthetic. The injection must always be made into healthy skin, otherwise a slough is likely to follow. The formula generally used is as follows:

Cocaine hydrochlorate, 2 grains; sterilized distilled water, 4 fluidounces; sol. carbolic acid (5 per cent.), 3 drops.

Literature of '96-'97-'98.

The corium should be first filled with the solution. This is accomplished by using a very fine needle and introducing it almost parallel to the surface of the skin. A few drops are injected, causing a slight wheal to appear, and after a pause of a few seconds the needle is pushed farther, and the process is repeated until the whole of the corium is infiltrated. The subcutaneous and deeper tissues are to be treated in a similar way. J. Jackson Clarke (*Lancet*, Jan. 18, '96).

Topical Administration.—Cocaine is applied locally to the mucous membranes and the skin for the relief of pain, to induce local anæsthesia for operative purposes, to control hæmorrhage, and for diagnostic purposes. When applied locally to a mucous membrane, cocaine causes a temporary blanching and shrinkage, with an anæsthetic condition of the part. The former are due to a constriction of the blood-vessels, the latter to a paralysis of the peripheral filaments of the sensory nerves. The anæmia produced is only temporary, and is followed by a marked congestion. For therapeutic study we will observe the application of the remedy on the various organs, noting at the same time the strength of the solutions generally used in each case.

EYE.—For use as an anæsthetic in the eye cocaine in solution of from 1 per cent. to 4 per cent. in strength may be employed, 1 to 5 or more drops being instilled. All operations of a painful character, the pain of an acute inflammation, or that caused by the presence of a foreign body are indications for cocaine. Its use in keratitis is not advised in that it has produced permanent opacities in the cornea.

NOSE, PHARYNX, AND LARYNX.—The application of cocaine (5 per cent. to 20 per cent.) in the mucous membrane of these parts is useful not only for therapeutic purposes and operations, but also for purposes of examination and diagnosis.

Literature of '96-'97-'98.

Before scarifications, etc., cocaine may be applied in a powder; cocaine hydrochloride, magnesium carbonate, $2\frac{1}{2}$ drachms. A moist compress is laid outside, for ten minutes, which the patient is instructed to press lightly against the part. If the skin is intact, pure basic cocaine must be used instead. Unna (*Jour. Amer. Med. Assoc.*, Apr. 30, '98).

The natural sensitiveness of the parts is obtunded by the anæsthesia induced; the shrinkage of the soft parts induced by the contraction of the blood-vessels makes more prominent the distinction between hypertrophy of the soft tissues and tumors of cartilaginous or bony character; again, by temporarily controlling the hæmorrhage (by contraction of the blood-vessels) and the shrinkage of the soft parts, the field of operation is made more clear and open. Nasal and laryngeal polypi are more easily diagnosed and removed, and operations on the uvula, tonsils, epiglottis, and larynx are facilitated. The Eustachian catheter is more easily introduced after the application of a solution of cocaine to the nasal cavities and the naso-pharynx. In acute coryza or rhinitis the insufflation every two hours of a small portion of a powder consisting of cocaine muriate, 1 part; bismuth subcarbonate, 5 parts; and talc, 15 parts, is useful. Another formula for the same uses consists of cocaine and morphine, 1 part of each; bismuth, 5 parts; used as snuff like the preceding.

Nine-tenths of patent catarrh-snuffs contain large quantities of cocaine,

combined with menthol, bismuth, carbonate of magnesia, and bicarbonate of soda. S. W. Sanford (*Med. and Surg. Reporter*, June 29, '95).

Cocaine carbolate has been recommended in nasal catarrh and ozæna, either pure or 5- to 10-per-cent. solutions in alcohol or spirit of ether, or 1-per-cent. solution in diluted alcohol containing 70 per cent. of water on cotton or by instillation, or 5- to 10-per-cent. triturations with acetanilid or boric acid for insufflation.

Cocaine solution is also used to anæsthetize ulcers or hypertrophies previous to the application of acids or instruments. Liquid applications may be made by means of cotton pledgets dipped in the cocaine solution by the spray of an atomizer; in powder by insufflation as above.

GENITO-URINARY TRACT.—The injection of a few drops of a 2-per-cent. solution of cocaine renders catheterization easy and painless, provided there is no stricture. Operations on the bladder (lithotrixy, litholapaxy, catheterization of ureters, etc.) are rendered painless through previous injections of cocaine. Weak solutions (not strong, the 2 per cent.) must be used, as fatal poisoning has followed the injection of 5 drachms of a 5-per-cent. solution into the urethra.

Wittsack, of Frankfort, advises the use of lactate of cocaine in the treatment of tubercular cystitis. He instills a solution containing 15 grains of cocaine lactate and 75 minims each of lactic acid and sterilized distilled water, previously emptying the bladder, but not washing it out.

GYNÆCOLOGY.—For application to the mucous surfaces of the vulva, vagina, and the uterine cavity, stronger solutions (10 per cent. to 20 per cent.) are used. Here, as elsewhere, the use of cocaine anæsthesia should be confined to minor

operations (curettage, dilatation of cervix, removal of uterine polyps, etc.). In operations extending below the surface parenchymatous injections should supplement the applications to the mucous surface.

RECTUM.—The anæsthetic solution (5 per cent.) is here applied to the mucous membrane by means of pledgets of absorbent cotton saturated with the solution. Parenchymatous injections may also be needed. In major operations or in complicated ones, general anæsthesia is advised.

SKIN.—The topical application of cocaine has been suggested for the cure of cracked and fissured nipples, but is not advisable, as through its use lactation may be interfered with. This latter suggests the use of a 5-per-cent. solution of cocaine made with equal parts of glycerin and water as a solvent to inhibit lactation or cause its complete cessation. The glands are bathed four or five times daily with the solution and supported by means of a bandage.

Incidentally it may be noted that Geley, of Bordeaux, has found that cocaine has an antipyretic action when applied to the skin, provided the applications be made at a time when the temperature is no longer rising. This action is analogous to that of guaiacol, though less marked.

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ETHER.—Sulphuric ether, or oxide of ethyl $[(C_2H_5)_2O]$, is a colorless, volatile liquid which evaporates at ordinary temperatures. Vaporized ether is heavier than air, and, being inflammable, its use as an anæsthetic in the presence of artificial light other than an incandescent electric lamp, is, therefore, attended with danger, unless the light be placed at a

considerable distance above the patient. Ether has a penetrating odor, generally regarded as pleasant, and a sharp, burning taste.

To avoid deleterious effects, it is necessary to use a pure preparation. The purity of ether may be tested by adding to it a small amount of oil of copaiba. Clearness of the solution indicates its purity; any emulsion or cloudiness indicates the presence of alcohol or water.

COMPARATIVE VALUE.—Ether is extensively used as an anæsthetic in the United States. In other countries chloroform is still preferred by the majority of surgeons, but ether is steadily gaining advocates, owing to its superiority in practically every direction. It possesses the following advantages: Greater safety, less marked after-effects, greater rapidity of induction of anæsthesia, equal muscular relaxation, and less shock.

The comparative safety of ether as an anæsthetic is further demonstrated by statistics. Those of Foy, based upon 877,507 chloroform administrations, show a mortality of 204, or 1 in 4301, while those of Julliard based upon 314,738 ether administrations show a mortality of only 21, or 1 in 14,987.

Statistics of the German Surgical Society, collected from 58 reports received from Germany and 9 from other sources: The whole number of cases in which anæsthetics were given is 51,846; of chloroform, 32,725; ether, 11,617; mixture of chloroform and ether, 3896; Billroth's mixture, 750; bromide of ethyl, 2769. In all there were 20 deaths,—a mortality of 1 in 2587; but 6 other deaths have to be added to this list, having been more or less due to an anæsthetic. Chloroform caused 17 deaths in 32,725, *i.e.*, 1 in 1924. Taking the figures of the past year (four in all) during which returns have been obtained by the society, there is an average of 1 death in 2645 administrations of chloroform; 1

death in 8014 of chloroform and ether mixture; 1 in 4890 of Billroth's mixture (chloroform, ether, alcohol); 1 in 26,268 of ether. Gurlt (*Deutsche med. Zeitung*, May 31, '94).

Three hundred and fifty thousand cases reported in which ether was used, with but 25 deaths, and 134,000 chloroformizations, with 46 deaths. Garré (*Beiträge z. klin. Chir.*, B. 11, H. 1, '94).

Literature of '96-'97-'98.

Experiments showing that chloroform, as compared with ether, is seven times more deadly when tried upon the isolated nerve; in other words, that in the case of ether there is seven times greater margin between the lethal and non-lethal doses than in that of chloroform. Waller (*Brit. Med. Jour.*, Nov. 20, '97).

The accumulated testimony of the past fifty years tends to prove conclusively that ether kills slowly, chloroform quickly; that ether kills by asphyxia, chloroform by cardiac paralysis; that ether gives plenty of warning, chloroform often none whatever; that ether is safer in healthy and strong people than in the weak and prostrated, but that chloroform is nearly as fatal in the vigorous as in the debilitated.

Ether does not demand any especial skill in its administration; chloroform does. Proper treatment easily and effectually overcomes the unfavorable symptoms from ether; treatment often does no good whatever in accidents from chloroform. In short, ether is the safest general anæsthetic known; chloroform is not. Gay (*Dunglison's College and Clin. Rec.*, Dec., '97).

In recent years, however, the view has been advanced that the mortality of ether was as great as that of chloroform when the after-effects of the former were taken into consideration. Cases in which pneumonia followed the administration have been repeatedly reported, some of which developed a few hours after anæsthesia.

Two cases of infectious pneumonia which developed a few hours after ether

anæsthesia; marked post-mortem evidences. Demonstrate possibility of infection subsequent to toxic irritation. Possible autoinfection of buccal origin. Nauwerck (*Deutsche med. Woch.*, Feb. 21, '95).

Case of œdema of the lungs one hour after anæsthesia, death one hour later. Reference to 7 cases of the same kind; and 8 cases of broncho-pneumonia also due to ether. If the deaths occurring subsequently were added to Gurlt's figures, the proportion would stand about 1 to 2 in favor of chloroform. Poppert (*Deutsche med. Woch.*, Sept. 13, '94).

In criticising the above cases Dudley Buxton states that, on carefully investigating the history of so-called cases of bronchitis and pneumonia following ether, but few are found to be really due to that agent. Removal of the patient to a cold ward after he has been in a hot operating-theatre and subjected to severe shock is the more probable cause of lung trouble, while the flow of saliva into the air-passages suggests the possibility of infection. These are independent factors which due care during and after the administration of the anæsthetic can counteract. It is important to bear in mind, however, that the untoward effects of ether are mainly exercised upon the respiratory system.

Physiological Action.—An all-important element in the physiological action of ether is its irritative influence upon the mucous membrane of the respiratory tract. Great irritation of the nasopharyngeal and laryngo-tracheal membrane thus ensues from the start, and arrest of respiration may be induced reflexly through the pneumogastric. Upon this fact is based the prophylactic measure proposed by Laborde, of Paris, and subsequently by Rosenberg in 1895, to apply a weak solution of cocaine to the nasal cavities prior to anæsthetization. The reflex influence is thus counteracted

through the benumbing action of the cocaine. The struggling and choking usually witnessed when the ether is administered too hastily is the result of the local irritation produced. The action of ether is principally exercised upon the respiratory centres.

[A tardy "cardiac syncope" under ether does not occur. If ether kill the healthy subject at all, it kills by asphyxiation, while chloroform may kill suddenly at any period of its use. DUDLEY BUXTON, Assoc. Ed., Annual, '95.]

Literature of '96-'97-'98.

Advantages of the cocainization of the nasal mucous membrane preceding and during anæsthesia are:—

1. As the patient's perception of the odor of the anæsthetic is much diminished, the feeling of suffocation is entirely absent.

2. The stage of excitement is either short or entirely absent.

3. Vomiting during narcosis is rarer than usual.

4. Sickness following anæsthesia does not occur.

The patient is directed to blow his nose in order to free it from mucus, then 2 centigrammes of a 10-per-cent. solution of cocaine are sprayed into each nostril. After a pause of two minutes 1 centigramme of the solution is applied again to each side, and then the anæsthesia may begin. Every half-hour the application of cocaine is to be renewed. Before removing the patient, the nose should receive a final spraying. At each application about 1 grain of the salt is used. It is important to maintain full anæsthesia uninterruptedly, as the dangerous fluctuations in the character of respiration and pulse always coincide with the necessity for crowding the anæsthetic. Rosenberg (*Annals of Surg.*, Jan., '96).

The influence upon the temperature is quite marked and is due partly to depression of the nervous system, the rapid evaporation and elimination of the drug from the lungs and general system, and

the active perspiration produced. These factors are doubtless operative in the production of the pulmonary after-effects reported.

The temperature is lowered to greater extent under ether than under chloroform. Angelesco (*La Semaine Méd.*, Dec. 14, '94).

[Profuse sweating, commonly associated with inhalation of ether, rapidly lowers temperature. Temperature of patient principally lowered just before operation. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

Important also in the production of untoward results is the influence of ether upon the kidneys. Albuminuria follows the administration of ether but rarely, but the presence of renal disorder prior to the use of the anæsthetic is a possibility to be considered in all cases in which albumin was found in the urine. Should renal insufficiency be induced, the pulmonary œdema witnessed as a complication would find a ready explanation, although death occurring during or after ether narcosis from œdema of the lungs has been attributed by Poppert and others to the toxic action of the ether. The majority of cases of post-anæsthetic bronchitis and broncho-pneumonia are also thought to be ascribed to these pathogenic factors.

Ether has very marked irritating influence on kidneys, but varying with the quantity administered. The urine should always be examined. As little ether as consistent with necessary effect should be given. Deaver and Frese (*University Med. Mag.*, July, '95).

True ether nephritis does not exist. Albumin is not found unless present before anæsthesia. Barendseld (*Münch. med. Woch.*, No. 41, '94).

In the great majority of cases normal kidneys not affected and no harm occurs when slight renal disease is present. Weir (*Med. Rec.*, June 8, '95).

Albumin found in seven out of one hundred cases. It disappeared within

forty-eight hours in all. Campbell (Annals of Surg., Dec., '94).

[These results agree with those of Wunderlich, Alber, Rindskept, and with my own. Ether-vapor is very rapidly eliminated,—mainly by the lungs. It is important to ascertain, in all cases of albuminuria following ether, whether the emunctories other than the kidneys are so damaged as to throw the elimination upon the latter. In my own experience any grave renal lesion following ether has been most exceptional, and I have never been able to satisfy myself that ether has ever caused a death in this way when it was given by me. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

Albumin in the urine after ether anæsthesia is due to the operative procedure more than to the anæsthetic. In marked renal complication following ether narcosis the operations had been performed on parts of the body, such as the mouth and rectum, where sepsis was most likely to result. Robert Weir (N. Y. Med. Jour., Mar. 1, '90).

Etherization in the vast majority of cases in normal kidneys, and even in abnormal kidneys, brings about no detrimental effects; when any evidences of abnormality present themselves they are transitory in character and not productive of harm. Elevation of temperature does not aggravate the work of the kidney and bring about, in conjunction with an ether narcosis, abnormal excretions. R. F. Weir (N. Y. Med. Jour., Nov. 16, '95).

In one hundred and fifty cases in which the urine was examined before and after etherization, but one case is found in which albumin was present after etherization, where it had been absent before, and this disappeared five days after the operation. Barenfeld (Münch. med. Woch., No. xli, '94).

Ether pneumonia may possibly be due, in some instances at least, to the action of intense cold upon the lungs, produced by the action of ether-vapor. Œdema of the lungs may arise from contraction of the pulmonary capillaries, thus producing a loss of *vis a tergo* and damping up the blood in the veins. Furthermore, the same conditions may produce sudden paralysis of the heart. The

chilling of the blood-stream may be responsible for the nephritis that occasionally follows etherization. Prolonged anæsthesia profoundly deteriorates the blood and strongly militates against recovery; hence rapidity of operation is most desirable. J. C. Da Costa (Med. News, Mar. 2, '95).

Literature of '96-'97-'98.

In 34.6 per cent. of cases given ether, albumin was not found before the ether was given, but was found afterward. In 34.6 per cent. albumin was found before and was increased afterward. In 26.6 per cent. of the cases there was no increase in the quantity of albumin after the ether was given. In 1.54 per cent. albumin was not found before or after the ether was given. In 1.33 per cent. albumin was found before, but was considerably less after the ether was given. In 1.33 per cent. albumin was found before ether was given, but was absent afterward. In 14.6 per cent. of the cases renal casts were found in the sediment before ether was given and were increased in number afterward. In 57.3 per cent. casts could not be found before or after. Only about 10 per cent. of the patients passed urine which was highly concentrated after taking the ether, the remainder only a slightly concentrated urine. The quantity of ether given in these cases varied from 100 to 800 cubic centimetres, and the length of time the patients were under the influence of the ether varied from ten minutes to an hour and a half. J. B. Ogden (Jour. of the Boston Soc. of Med. Sci., '97).

Although ether is not destructive to red blood-corpuscles, it nevertheless produces diminution of the hæmoglobin and leucocytosis: effects which render rapidity of the operative measures desirable.

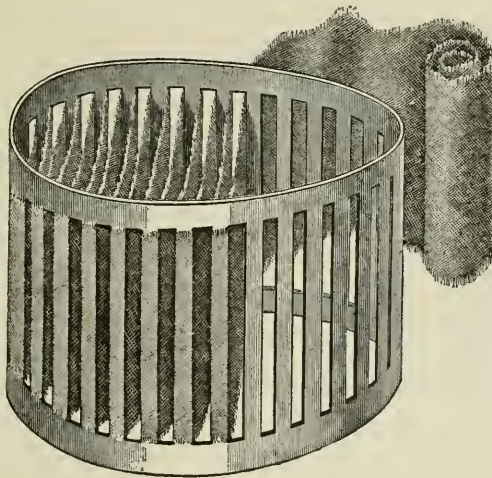
Literature of '96-'97-'98.

Ether anæsthesia in men has no destructive influence on the red corpuscles: it causes a very marked leucocytosis, the maximum amount of leucocytosis being first found immediately after the anæsthetic is well drawn; it may produce albuminuria; yet, even where there are

diseased kidneys, ether is preferable to chloroform. Lerber (*Centralb. f. Gynäk.*, No. 19, '97).

Method of Administration. — The stomach should not contain food, lest it be regurgitated during the administration of the anæsthetic; hence nothing should be taken by the patient within the four hours preceding the operation, the last meal being liquid; a soft-boiled egg may, however, be included among the aliments allowed. The rectal administration of milk with a little brandy or caffeine, or warm coffee, is advisable

brane of the upper respiratory tract, and suffocation, manifested by struggling and other evidences of fright, results. If a cone is employed, therefore, the apex should be open as well as the base, the opening being at least one inch in diameter, the aim being to give a very small quantity of the anæsthetic at first, and to mix that with a sufficient quantity of air. An imperfect cone is worse than the plain folded towel used by many operators, since the air is easily admitted from all sides beneath the horizontal surface of the towel.



Allis's inhaler.

when the operation is to be a prolonged one, or when the patient is weak. False teeth and neckwear should be removed, and everything so disposed as to insure respiratory freedom.

INSTRUMENTS. — The method most generally utilized is to form a cone or cornucopia with a towel; but the cone usually obtained in this manner is closed at the upper end; when the ether is poured into it, and when its base or open extremity is applied to the face a quantity of ether-vapor deprived of air suddenly impinges upon the mucous mem-

When a more perfect instrument is to be used, Allis's inhaler (see illustration) can be recommended. Its perpendicular linen partitions allow a free passage of air, and when the patient inhales he receives, if the instrument is properly used, equal quantities of air and ether-vapor.

A graduated bottle, such as that devised by Holtzclaw (see next page), is advantageous. In the ground-glass stopper there are, on opposite sides, two grooves extending about half the length of the stopper. When wanted for use,

the stopper is turned so that its grooves come in apposition with the air-hole on one side and with the groove in the neck on the other. This adjustment can be so regulated as to permit a stream to flow or only a drop every two or three seconds. When not in use the stopper is turned half-way around.

A combination of inhaler and graduated bottle has been contributed by Rosenberg, the construction of which can readily be understood by the illustration shown on the opposite page.

Another excellent combination instru-



Graduated dropper. (*Holtzclaw, Medical Record.*)

ment is that of Vulpis, shown in the illustration on the opposite page.

The preliminary application of a 5-per-cent. solution of cocaine by means of an atomizer (a few puffs being sufficient) is of importance, as already stated, to avoid the reflex influence of the nasal nerve-supply, or a little nitrous oxide may be given for the same purpose—an excellent method, according to Dudley Buxton.

The previous administration of nitrous oxide greatly facilitates the administration of ether. George Eastes (*Lancet*, Apr. 12, '90).

When nitrous oxide is given before

ether, only sufficient should be given to render the patient partially insensible—till the sensation of lightness of the head is induced. All the unpleasantness of ether is thus lost. E. M. H. Rogers (*Bristol Medico-Chir. Jour.*, Mar., '95).

Suggestion that patient be allowed to smell at the ether-bottle or inhale from the inhaler, holding it away from the face with his own hands. This preliminary step produces anæsthesia of the pharyngeal mucous membrane, and overcomes the feeling of suffocation and inclination to cough which so often mark the initial stage of etherization. Rushmore (*Jour. Amer. Med. Assoc.*, Mar. 19, '92).

Literature of '96-'97-'98.

When ether is mixed with twice its volume of a bland, light preparation of liquid petrolatum and thoroughly nebulized with a suitable atomizer, it is absolutely unirritating. A few puffs of the mixture from the atomizer directly into the nostrils, before administering ether in the usual way, followed by happy results. D. H. Ludlow (*Phila. Polyclinic*, Feb. 8, '96).

As soon as the muscles of the neck are sufficiently relaxed the head must be turned well to one side; much of the secretion will then run out of the mouth. Fully one-half the difficulty of an ether administration results from the undue accumulation of fluid in the trachea and bronchi, and no pains should be spared to avoid the trouble. J. F. W. Silk (*Treatment*, Nov. 25, '97).

The administration, previous to the ether, of a subcutaneous injection of $\frac{1}{6}$ grain of morphine and $\frac{1}{120}$ grain of atropine sulphate has also been recommended.

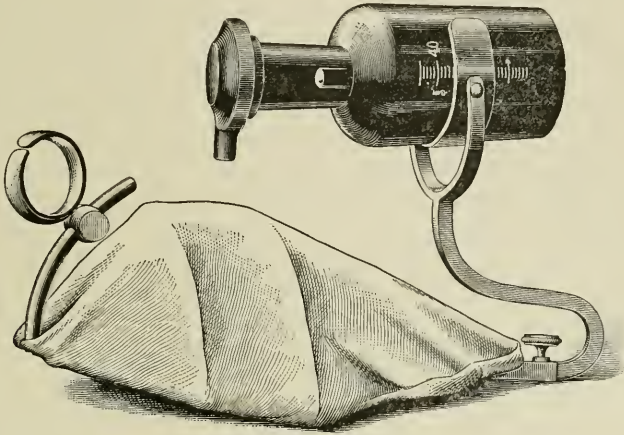
Administration.—When ether is to be administered, the patient should be well covered, to prevent lowering of temperature, and his body should be protected against chilling by the judicious application of towels over the parts that would otherwise become moistened by the anti-

septic solutions used in connection with the operation.

After pouring a small quantity of ether upon the towel, cone, or inhaler used, the latter should be held some dis-

quantity of air as the instrument used will admit when applied close to the face.

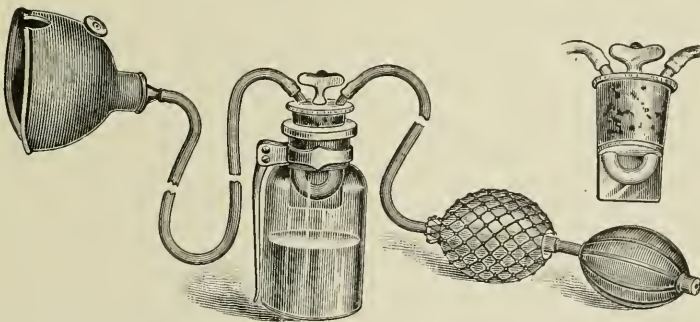
Important in this connection is the fact that ether-vapor is irritating to the eyes; this untoward effect may be pre-



Inhaler-mask and dropper. (*Rosenberg, Centralblatt für Chirurgie.*)

tance from the face, taking care to avoid gagging the patient. "Air" slightly impregnated with ether should be the first rule, and "ether impregnated with air" the second; but the latter is only appli-

vented by placing a wet compress over them as soon as the patient is beginning to show signs of anæsthesia. If done at first this procedure is apt to cause apprehension and the fumes are sufficiently



Modification of Junker inhaler. (*Vulpinus, New York Medical Journal.*)

cable when the patient's membranes have become tolerant of the action of the ether. When this stage is reached, however, the agent may be pushed until the ether-vapor is inhaled with as small a

condensed to cause irritation only when the inhaler is close to the face—though not against it. To protect the skin of the face, a little cosmolin applied over it is very efficient.

The effects produced by ether may be divided into three stages:—

1. A stage in which the patient shows symptoms of mental confusion; the pulse is increased in strength and rapidity, and the respiration is accelerated. There is usually some lividity, a few unconscious muscular movements, and rambling words. Spoken to loudly, however, he may understand what is said and respond. The patient may be hilarious soon after the administration of the anæsthetic is begun, but the exhilaration usually marks the advent of the second stage. At this time occurs a period of "primary anæsthesia," during which certain small rapid operations, such as opening an abscess, can be performed.

2. The second stage is one of excitement. The patient acts, especially if the ether be given too rapidly, as if he were intoxicated, and endeavors to free himself from the attendants, who are obliged to hold him. He tries to remove the towel, cone, or inhaler, and to rise. Hallucinations are frequent during this stage, and, when ether is administered to a woman, a third party should invariably be present. These symptoms are less likely to occur if the anæsthetic is administered in the manner indicated above.

Struggling is usually due to the impatience of the anæsthetist, who attempts to push the ether too rapidly, and in so doing partly asphyxiates the patient. Vallas (*Revue de Chir.*, Apr., '93).

Vertigo, tinnitus, and deafness, gradually followed by a feeling of heaviness, are experienced by the patient, who then passes into the third stage, that in which all consciousness has ceased to exist. During this stage there is no excitement, the breathing is regular and there may be snoring. When this is the case, however, the head should be turned to

one side so as to cause the uvula to drop sidewise and increase the size of the passage. The skin is moist and the face is red and suffused. The muscles are relaxed, the arm dropping when raised.

Dose.—The quantity utilized cannot be established upon a fixed rule; but $\frac{1}{2}$ to 1 ounce is usually employed during the first two stages. Small quantities poured from time to time upon the inhaler are necessary to keep the patient "under." The intervals are necessarily shortened when operations about the rectum, vagina, or urethra are being performed, which seem to cause return to consciousness sooner than when other regions are being submitted to active procedures.

The pulse-rate is increased by hæmorrhage; quickening of pulse and respiration means an overdose. The breathing-rate is increased reflexly by certain manipulations of the anus, rectum, and peritoneum. Campbell (*Annals of Surg.*, Dec., '94).

Literature of '96-'97-'98.

The following method is of great service in estimating the degree of anæsthesia in infants and children: The index finger should be placed in the infant's hand; during the earlier part of the administration the finger is grasped very tightly, the palmar reflex being active; but, as insensibility approaches, the infant's fingers gradually relax, and as soon as they become loose the operation may be commenced. In the infant the anæsthetizer should devote his constant attention to the amount of palmar and digital reflex action present. Care should be taken against cold air's being breathed for several hours after the operation. F. Woodhouse Barine (*Practitioner*, Oct., '96).

Ether greatly lessens the force of muscular contractions (including the uterine) so soon as one-half minute after inhalation begins. The effect of ether disappears in from five to twenty minutes. The contractions of the abdominal mus-

cles cease during anaesthesia under ether. The patient recovers her power of uterine contraction far sooner after the use of ether than after the employment of chloroform. Hensen (*Archiv für Gynäk.*, B. 55, H. 1, '98).

Contra-indications.—The main toxic effects of ether involving the respiratory centres, any disease of the respiratory tract is thought to reduce the safety of anaesthesia in proportion with the degree of involvement. It is probable that the respiratory centres are influenced in both ways: reflexly at the start through the nasal nerve-supply, or, later on, in subjects suffering from stenotic disorders of the respiratory tract, as a result of the toxæmia through undue exposure of the pulmonary area to the effects of ether. Hence, all conditions tending to reduce the diameter of the trachea or the bronchial tubes, goitre, asthma, bronchitis, etc., are to be looked upon as compromising factors. The Trendelenburg position, considerably used at present, is dangerous, through the pressure exerted upon the diaphragm by the intestines.

Experience of five hundred cases of ether narcosis in Dresden. Excellent in ordinary surgery, but is contra-indicated in phthisis and for persons afflicted with goitre. Butler (*Archiv f. clin. Chir.*, B. 40, p. 66, '92).

Ether is not recommended for operations on the face, and is directly contra-indicated in all diseases of the air-passages, including compression of the trachea. P. Ziegler (*Münch. med. Woch.*, No. 23, '95).

Twenty-five thousand cases anaesthetized by the author during twenty-seven years. In young subjects up to the age of 14 years ether is found too irritating, especially when any trace of bronchitis existed. In aged persons suffering from emphysema and pulmonary catarrh, ether is contra-indicated. Poncet (*Med. Press and Circular*, June 12, '95).

Ether is contra-indicated in operations within the mouth and upon or close to

the air-passages; certain conditions of the lungs, particularly acute bronchitis, asthma, double empyema; advanced renal disease and diabetes; operations demanding the use of the actual or thermocautery upon or close to the face. J. B. Blake (*Boston Med. and Surg. Jour.*, June 6, '95).

Advanced age regarded as a drawback to ether. The use of stimulants before the operation is deprecated, as likely to cause overstimulation, and slow etherization is regarded as dangerous. Lesions of the lungs or kidneys are far more important in the ether prognosis than those of the heart, blood-vessels, or brain. Guest (*Amer. Pract. and News*, Aug. 27, '92).

Organic heart disease is not looked upon now with as much dread as formerly, but when the cardiac disorder is sufficiently advanced to cause dyspnoea or oedema, or when there is concomitant and marked asthenia, the circulatory system may quickly succumb as a secondary result of the respiratory paresis. The presence of arteriosclerosis is not thought to increase the danger; but all such cases should be closely watched.

Post-mortem appearances in a series of deaths during ether anaesthesia: Extensive disease of the heart found in 5 cases; in 3, death from cardiac syncope was reported, and the autopsy revealed extensive pulmonary disease, in 1 case coupled with morbus cordis. In 6 cases death took place before the operation, in 2 during, and in 2 immediately afterward. Of the deaths under ether, 2 occurred in persons exhausted by constant vomiting, due to intestinal obstruction, 1 from apparent cardiac syncope, the patient being a confirmed drunkard and in delirium tremens at time of operation. The death under "gas and ether" was that of a very anæmic, weakly woman. R. Williams (*Med. Chronicle*, p. 150, '93).

In 15,000 etherizations but two deaths. In the one case a tubercular infant in a depraved state of health died from asphyxia. The necropsy showed advanced aortic disease and disseminated tubercu-

losis. In the second case an anæmic woman was, after the operation, placed in the sitting posture while being carried to her bed. Although apparently rallying under restorative measures, she died in the night from symptoms of progressive nervous exhaustion. Overvigorous attempts at artificial respiration seem to have done this patient grievous bodily harm. Poncet (Annual, '95).

Arteriosclerosis does not constitute a contra-indication for the use of ether. The deaths by chloroform occur, in the majority of cases, in young, robust, and healthy persons before complete chloroform narcosis is obtained. Ether deaths are met with usually in persons over 50 years of age, and are generally accounted for by lesions found at the autopsy. Robert Weir (N. Y. Med. Jour., Mar. 1, '90).

Literature of '96-'97-'98.

Case of man in good health to whom ether was administered in order to break up adhesions. Operation was completed, and administration of ether stopped. The patient breathing stertorously and well, like one recovering from ether. Corneal reflex tried and found present. About half an hour after administration of any ether, breathing noticed to be in gasps, and patient blue in the face. Death followed immediately.

At post-mortem intense venous congestion the only abnormal sign found. H. Hammond Smith (Brit. Med. Jour., Jan. 8, '98).

Advanced kidney disease is a radical contra-indication to the use of ether, especially since ether-pneumonia has been attributed to the renal insufficiency. Albuminuria, if not marked, does not seem to compromise the result.

Ether is not dangerous when slight renal disease exists. The presence of abnormal urinary ingredients is not an absolute contra-indication to ether. Feutin (Annual, '93).

In ether anæsthesia the kidney becomes congested, and on microscopical examination the cells show cloudy swelling. The cells of the convoluted tubules

are primarily affected, the tufts and collecting tubules only evincing change when the anæsthesia has been prolonged. The local effect of ether is deleterious to an already diseased kidney. In cases of nephritis, ether should be given only with the greatest care, continually watching for any signs of failure of the respiration. George B. Wood (Univ. Med. Mag., Sept., '94).

Literature of '96-'97-'98.

Ether and chloroform act as poisons, causing degenerative, inflammatory, or necrotic processes, sufficient, in organs previously weakened, to bring about cessation of their functional activity. Parasporo (Il Policlinico, Dec., '97).

Many surgeons prefer chloroform to ether when children are to be anæsthetized, but this preference is not based on good ground, all things being equal. Pneumonia is no more likely to occur than under chloroform, if care be taken to avoid undue exposure of the body during and after the administration of ether.

Ether is to be employed with preference in infants. St. Germain states that he has chloroformed 6000 infants without a single death. For the same period of life—i.e., up to 12 years—there is not one death recorded from ether, while from chloroform there are 21 deaths found in literature. R. Weir (N. Y. Med. Jour., Mar. 1, '90).

During ether anæsthesia the temperature falls. The variation in temperature is much more marked at first than subsequently. The fall continues, though slightly, during deep sleep after anæsthesia. The temperature begins to rise at the moment of waking, and proceeds in an inverse ratio to the fall, so that the variation becomes more and more marked in proportion as the patient gets more thoroughly awake.

This lowering is due to the fact that ether determines well-marked vasodilatation, loss of heat naturally following. Angelesco (Medical Week, Dec. 14, '94).

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The effect of ether inhalations upon the lungs is a double one: (1) the pulmonary vessels lose their tone and dilate; (2) their walls become more pervious, and hence œdema results. Without cardiac weakness the œdema cannot become dangerous. W. Lindemann (Centralb. f. Path., 11-12, '98).

Untoward Effects.—During ether anæsthetization the most frequent untoward feature is retching and vomiting, even when proper precautions have been taken to insure an empty stomach. It is often due, according to Buxton, to swallowing of mucus and saliva impregnated with ether, but the liquid regurgitated is often mixed with bile. The patient's head should be gently tilted to one side so as to cause the fluid to vacate the air-passages, the mouth being opened with the gag if necessary; the liquids remaining in the mouth are swabbed out with a small sponge held with forceps. The vomiting is of no importance in itself; it is of vast importance, however, if the freedom of the air-passages is not borne in mind, since the aspiration of some of the ejected substances may cause asphyxia. When the mouth is opened and cleared, it is well to draw the tongue with the fingers (protected by a napkin) so as to facilitate the passage of air through the larynx by raising the epiglottis. If any asphyxia show itself, Laborde's method—rhythmic tractions of the tongue eighteen times a minute—is to be practiced. Vomiting unattended by other untoward symptoms does not preclude continuation of the ether.

Sixty-three cases of asphyxia due to various causes restored by rhythmic traction of the tongue. Laborde ("Les Tractions Rhythmiques de la Langue," Paris, '94).

Usually, quickened breathing indicates a too-shallow zone of anæsthesia,

requiring more ether. Respiration, color, and the pupil should always be watched. Any cyanosis renders it imperative to give the patient more air.

Failure of the respiration is shown by lividity of the face and other evident signs. The pupils are dilated and the lips blue; cardiac failure may follow or manifest itself suddenly before the respiration ceases, but, ether being a cardiac stimulant, this very rarely occurs, and almost all the deaths that have taken place have been due to preliminary lung disease or to some organic disorder involving the respiratory tract.

Treatment of Ether Collapse.—Arrest of respiration calls for the immediate injection of $\frac{1}{20}$ grain of strychnine and of 10 minims of the fluid extract of digitalis, supplemented by rectal injections of warm coffee. Cardiac failure is best counteracted by means of atropine sulphate: $\frac{1}{120}$ grain given hypodermically. The Sylvester should at once be instituted, and the indications given under CHLOROFORM (volume ii) resorted to if prompt results are not obtained.

After-effects.—Vomiting is a very common after-effect of ether anæsthesia. It is rarely persistent. A mixture of 4 to 5 drops of chloroform with 2 to 3 drops of vinegar of opium is recommended by Buxton. Inhalations of strong vinegar-fumes (or acetic acid) sometimes act promptly.

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Oxygen has a positive value in shortening the time of returning consciousness and in diminishing the unpleasant after-effects of ether. It is a good cardiac and respiratory stimulant and is indicated in threatened collapse. J. B. Blake (Boston Med. and Surg. Jour., Nov. 12, '96).

The use of oxygen after ether in a number of cases has led to the conclusion that some cases receive much benefit

from its use. Some cases are not benefited (or are positively harmed) by oxygen. The best method of administering oxygen after etherization is by the use of a soft-rubber catheter gently introduced into the nares until the eye of the catheter is approximately opposite the opening in trachea. Wm. A. Morrison (Boston Med. and Surg. Jour., Apr. 16, '96).

The most satisfactory method of controlling nausea and vomiting after anæsthesia is the administration of strong vinegar by inhalation. A towel or cloth, saturated with fresh, strong vinegar, is held a few inches above the patient's face, or hung from the bedstead, so that it will be near his head. It should be used directly after the anæsthetic has been discontinued, and kept up continuously for hours. J. T. Rugh (Dunglison's College and Clin. Rec., Apr., '98).

Ether-pneumonia may be caused by direct exposure to the surrounding air, while the powers of resistance of the system are reduced as a result of the operation and of the physiological effects of the anæsthetic. The temperature is generally reduced from $1\frac{1}{2}$ to 1 degree by the evaporation from the lungs, and exposure, especially when any portion of the body is wet, that would under other circumstances produce no evil effect, now becomes dangerous. Important also is the quality of the ether employed. Remnants from partially-emptied bottles should never be used.

[Attention drawn some years ago to dangers arising from rapid evaporation of ether from pulmonary mucous membrane by Tait. Best plan is to give ether from a closed inhaler separated from the patient's face by a bag containing air. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

Pulmonary symptoms occur in series. They are due to decomposed ether, which then gives off vinous alcohol and peroxide of hydrogen. Ether should be kept in small, entirely-filled, well-corked bottles, kept in cool, dark place. Remnants taken from partially emptied

bottles should never be used. Bruns (Berliner klin. Woch., Dec. 17, '94).

[This plan was adopted at my suggestion at University College Hospital with the best results, for some years past. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

If pure ether is employed there is little or no danger of pulmonary complications. Aldehydes, so commonly present, are a source of danger. Lépine (Lyon Méd., July, '94).

With the exception of acute pulmonary troubles, there are few, if any, contraindications to ether when properly given. Ether is as efficacious as chloroform, and the death-rate is far less than under chloroform. Vallas (Revue de Chir., Apr., '93).

Ether rarely acts as the exciting cause of acute lobar pneumonia, and the few cases found may have been simple coincidences. W. H. Prescott (Boston Med. and Surg. Jour., Mar. 28, '95).

Atropine internally, combined with minimum amount of ether, properly given, might cause ether vomiting to be greatly reduced. J. B. Blake (Boston Med. and Surg. Jour., Sept. 27, '94).

[A minimum quantity of ether has more to do with the lessening of ether vomiting than has the atropine. The two important points in this connection are: (1) care must be taken that the patient does not swallow mucus and saliva impregnated with ether; (2) he must not be lifted and moved about while he is under ether. With some persons, however, severe vomiting will take place whatever precautions are adopted. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

It is very important, as has repeatedly been shown in this article, to keep the patient warm while he is under the anæsthetic and afterward. He should be wrapped in blankets, and hot-water bottles should be placed around him.

Among other complications of ether anæsthesia are mental excitement and nervous phenomena of various kinds. These, however, promptly disappear in

practically all cases under symptomatic treatment.

Local Anæsthesia.—Local anæsthesia may be obtained by means of a spray of ether, which acts by causing intense cold of the surface by evaporation. It is a useful procedure for minor surgical operations, especially for the opening of abscesses. It has been also used for major operations, but is far inferior to other methods.

Therapeutics of Ether.—Hypodermically, ether is of value in the treatment of many conditions. Its widest application is in the treatment of shock, sinking-spells, collapse, cardiac failure, and convulsions. Ten to 15 drops hypodermically, or more in strong adults, is sometimes followed by prompt reaction. It is also valuable in asthma, hiccough, and other spasmodic neuroses, and in hysteria, neuralgia, and migraine. Thirty to 80 minims in ice-cold water or in capsules, followed by a mouthful of water, are promptly effective in most cases. It has also been used by rectal injection, but the local irritation produced counterbalances its advantages.

Case of paralysis observed following the subcutaneous injections of ether. Ether produces neuritis, and the anæsthetic should be injected where there are few nerves, or where these are well protected, care being taken not to penetrate too deeply into the tissues. Eberhart (*Centralb. f. Gynäk.*, No. 12, '91).

Brilliant results reported from the subcutaneous injection of ether in the case of a woman apparently moribund from the fumes of burning charcoal, other remedies having been used in vain. Testevin (*L'Abeille Méd.*, Aug. 6, '88).

Instance observed in which injections of ether relieved a grave case of cardiac insufficiency due to fatty degeneration of the heart. Bamberger (*Jour. Amer. Med. Assoc.*, Feb. 15, '88).

Vapor of ether injected into the rectum in lead colic. It calms the spasmodic

state and renders the action of purgatives less irritating. A rubber tube should be attached to a small bottle of ether, the end passed into the rectum, and the bottle placed in warm water. A. Torre (*Bull. Gén. de Thér.*, Feb. 15, '88).

In influenza, and the weak states that follow it, injections of ether appear to act remarkably well, especially in those cases in which pneumonia ensues. Peter (*Times and Register*, Apr. 22, '90).

Literature of '96-'97-'98.

Ether recommended in large doses in the treatment of various forms of nephritis, especially as a powerful means of mitigating and even curing dyspnœa due to uræmia. The treatment consists in giving, every half-hour or every hour, 2 or 3 teaspoonfuls of ether in a little sweetened water. It is better to give part of the ether subcutaneously. M. Lemoine and M. Gallois (*Jour. des Practiciens*, July 3, '97).

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ETHMOIDITIS. See SINUSES, DISEASES OF.

ETHYL-CHLORIDE.—Chloride of ethyl (Mono-chlor-ethane) is a gas at ordinary temperatures, but when compressed it becomes a colorless, very inflammable liquid, boiling at 54° F. When ignited it burns with a green flame. It has an aromatic, sweet taste and an ethereal odor. It is exceedingly volatile, which latter property renders it unfit for genuine anæsthesia.

Dose and Physiological Action.—For internal use it has been given in doses of 10 to 30 drops dissolved in an equal quantity of alcohol. When thus taken it has a stimulating action. When ethyl-chloride is inhaled its chief effect appears upon the circulation and respiration, there being a marked lowering of

the pulse-rate and the blood-pressure; the respirations are at first increased in depth and frequency. Tonic doses cause cessation of cardiac and respiratory movements. Sprayed on skin or mucous membrane, it causes them to become white, cold, and insensitive.

Poisoning by Ethyl-chloride.—Ethyl-chloride inhaled in tonic doses produces poisonous effects similar to those of chloroform, but is less of a cardiac depressant. Death results from paralysis of the respiratory centres and the heart.

Treatment of Poisoning by Ethyl-chloride.—When poisoning has been induced by inhalation, the tongue should be drawn forward, and caffeine, strychnine, or atropine given by hypodermic injection. Artificial respiration should be used faithfully, the head being lowered as in chloroform syncope. Amylnitrite, ammonia, and warmth are also useful.

Therapeutics. — While ethyl-chloride has been given continually as a stimulant, its use is not advised, as other equally-efficient stimulants are available which are free from danger. We would also warn against its use for the purpose of inducing general anæsthesia, as the dangers incurred therefrom are too great. The legitimate field of usefulness of ethyl-chloride lies in the production of local anæsthesia for the relief of pain and for the purpose of performing minor surgical operations in dental surgery.

LOCAL ANÆSTHESIA.—Ethyl-chloride is usually dispensed in large tubes, one end of which is drawn out to a fine point, or in tubes closed by an automatic cap. When the former are used, the point is broken off, and the tube held in the hand, at a distance of from six to ten inches from the part to be anæsthetized. The heat of the hand causes the liquefied gas to issue in spray-form. By its

rapid vaporization the part soon becomes frozen and ready for operation. As the skin hardens under the ethyl-chloride the exact limits of the operation must be determined beforehand. The highly-inflammable nature of this agent must be remembered, and operations must be done at a good distance from gas and other flames or by electric light. The absence of unpleasant after-effects and of any influence on the sensory centres of the brain are its advantages over some other agents used for local anæsthesia. It is used in the treatment of ingrowing toe-nail, the opening of abscesses, removal of ganglia, or for any painful skin-incision. If the liquid is ignited as it issues from the broken tip, the flame thus produced may be used to cauterize septic or aseptic wounds or for cutaneous cauterization.

NEURALGIA.—Ethyl-chloride in spray has been used with success in supra-orbital and facial neuralgia, sciatica, neuralgia of the breast, upon the painful joints of incipient gout, scrotal pruritus (diabetic), and in migraine. From 2 1/2 to 5 drachms may be used in spray at one sitting, the lesser quantity usually being sufficient.

C. SUMNER WITHERSTINE,

Philadelphia.

EUCALYPTUS.—Eucalyptus U. S. P. is the leaves from the older parts of the *Eucalyptus globulus labillardiere*. The eucalyptus, or blue-gum tree, is a tall, evergreen tree, a native of Australia, but now grown all over the world. From the leaves the oil of eucalyptus is obtained by distillation, and from this oil by redistillation with caustic potash or calcium chloride a camphoraceous body is obtained which is known as "eucalyptol." The latter is the refined product.

It was once thought that as the tree

grew easily in marshy districts and drained the soil of water, it would diminish the malarial miasm of low swampy regions, and in that way prove a prophylactic against malaria. Laveran has shown, however, that the organism causing malarial troubles is, in all probability, taken into the body through the media of food and drink, and that the planting of the eucalyptus-trees does not diminish the paludal fevers. The prevailing view that mosquitoes are the main intermediaries through which the infection occurs also tends to diminish faith in eucalyptus as a prophylactic.

The leaves have a camphoraceous odor and a pungent, bitter taste, and yield a volatile essential oil, the oil of eucalyptus, which is the active principle. Eucalyptus-oil is a faint-yellow, sometimes colorless liquid, having a characteristic aromatic odor and a pungent, cooling taste, and being soluble in alcohol and in bisulphide of carbon. The value of the oil depends upon the amount of eucalyptol present.

Eucalyptol is a colorless liquid, with strong aromatic camphoraceous odor; is slightly soluble in water, but easily soluble in alcohol, ether, and fatty oils.

By treating oil of eucalyptus with hydrochloric acid Anthoire has obtained a white, micaceous, scaly substance, hygroscopic in nature, called eucalypteol. It is soluble in alcohol, ether, chloroform, and oils, but almost insoluble in water and in glycerin. It is not poisonous, and is tolerated by the stomach.

Preparations and Dose.—Eucalyptus, $\frac{1}{2}$ to 2 drachms.

Extractum eucalypti fluidum, 10 drops to 2 drachms.

Oleum eucalypti, 5 to 20 minims.

Eucalyptol, 1 to 15 minims.

Eucalypteol, 24 grains daily, in divided doses.

Physiological Action.—Applied externally, the oil is a decided irritant, and causes heat and redness of the part, due to dilatation. When inhaled it causes an increase of the saliva and of the bronchial secretion. When taken internally in medicinal doses it produces a feeling of warmth and stimulation, with increased secretions, while larger doses are productive of disordered digestion, diarrhoea with loose stools having the characteristic odor of the oil, and symptoms of renal and cerebral congestion and force. The pulse is increased in frequency. In larger doses there are noticed a rapid, weak pulse, general excitation, and restlessness; decrease of body-heat, lower arterial pressure, irregular and weak respirations; muscular weakness, especially of the lower limbs; and death from respiratory paralysis. The drug is eliminated by the bronchial mucous membranes, the skin, the kidneys, and the bowels. The urine may have the odor of violets, as noticed after the ingestion of the oil of turpentine. The oil of eucalyptus, like most aromatic oils, is an antiseptic and a germicide, and in sufficient strength it inhibits the growth of micro-organisms in culture-media. Eucalyptus is a powerful diuretic. An increased excretion of urine is said to follow its internal use.

Poisoning by Eucalyptus.—Tonic doses of eucalyptus give rise to the symptoms of gastro-intestinal irritation, renal and cerebral congestion, impaired circulation, muscular weakness and paralysis, and finally death by respiratory failure. Cases of poisoning by this drug are not frequent.

Treatment of Poisoning by Eucalyptus.—In mild cases the gastro-intestinal symptoms should be ameliorated through the use of morphine, bismuth, lime-water, etc. In severe cases, when the

circulation and respiration are profoundly affected, the use of caffeine, strychnine, and atropine by hypodermic injection is advised.

Therapeutics.—Eucalyptus has a selective action upon the mucous membranes, being excreted through them. To them it is a stimulant, antiseptic, germicide, and antispasmodic, and we find that its most beneficial action is exerted, therefore, directly upon the gastro-intestinal tract, the bronchial tubes, and the genito-urinary tract; indirectly upon certain mucous disorders more or less dependent upon the integrity of tissues and function of those organs. In general, it is contra-indicated in acute inflammatory conditions.

GASTRO-INTESTINAL DISORDERS.—In atonic dyspepsia and chronic gastric or intestinal catarrh, eucalyptus is one of the most useful stomachics. In convalescence from acute disease and in debility from defective assimilation it is a useful stimulant and tonic. In the flatulence, cardiac palpitation, and hot flashes of the menopause it is often of permanent benefit. It has been found useful in cholera, 5 minims being given in milk every quarter-hour for one hour, then every hour. On account of its antiseptic action, eucalyptus-oil and eucalyptol have been used in typhoid fever, being administered in capsules.

BRONCHIAL DISORDERS.—In subacute and chronic bronchitis eucalyptus loosens the secretions, stimulates and gives tone to the mucous membrane, and exerts, withal, an antiseptic action, especially in cases accompanied by free mucopurulent secretion. It is also useful in bronchorrhœa.

GENITO-URINARY DISORDERS.—In chronic cystitis, pyelonephritis, and chronic desquamative nephritis eucalyptus has been recommended as an efficient

remedy. In subacute gonorrhœa Hare advises 6 minims each of eucalyptus-oil and sweet-almond oil in a capsule after meals.

MALARIAL FEVERS.—Eucalyptus has been praised as a remedy for intermittent fever, in the absence of quinine or where idiosyncrasy interdicts its use. It cannot take the place of quinine to arrest the paroxysms, or to prevent relapses at the septenary periods, but is more useful than quinine to reconstruct the damages in the organs of assimilation caused by malarial infection. (Bartholow.)

NERVOUS DISORDERS.—Spasmodic asthma is much relieved by eucalyptol given by steam-inhalation. Cigarettes made from eucalyptus-leaves alone, combined with stramonium, belladonna, tobacco, etc., give similar relief. Pertussis has been relieved by a mixture of 1 part each of eucalyptus-oil and terebene, and 6 parts of alcohol, used in spray half an hour before meals and at bed-time (Hawdricke). Malarial or congestive headache may be relieved by oil of eucalyptus, 5 minims being given four or six times daily.

C. SUMNER WITHERSTINE,

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EUROPHEN.—Europhen, or iodo-di-iso-butyl-ortho-cresol, is the result of the action of iodine on iso-butyl-alcohol and ortho-cresol with zinc chloride by heat (Merck). It is allied to aristol and appears as a light, dull-yellow, amorphous, aromatic powder, which is soluble in alcohol, ether, chloroform, and oils, but insoluble in glycerin or water. It has an aromatic odor, like saffron, but has no taste. It is stable when kept dry. On prolonged exposure to moisture it is decomposed, setting free nascent iodine. If heated to 158° F. in the presence of

water it is decomposed; hence heat should not be employed in making solutions of it. It contains 28.1° of iodine (Merck). It was introduced as a substitute for iodoform. Europhen is incompatible with the metallic oxides, all preparations of mercury, and starch.

Dose and Physiological Action.—Internally the dose is 1 to 3 grains. By hypodermic injection (in a 3-per-cent. to 10-per-cent. solution in olive-oil) the dose is 1 to 1½ grains, once daily. Externally, it is used in 5-per-cent. to 10-per-cent. ointment, dissolved in olive-oil or lanolin (5 per cent. to 30 per cent.), as a dusting-powder (1 part to 3 of boric acid), in 10-per-cent. gauze, or pure.

The therapeutic value of europhen depends upon the liberation of iodine when it is exposed to moisture. In this its action is similar to that of iodoform; but europhen parts with its iodine more slowly, even under the most favorable conditions; and while it is thus less poisonous than iodoform it is also, for the same reason, less efficient.

Case of gumma of the thigh previously treated with iodoform without ill effects. Europhen was applied and gave rise to a severe exudative erythema of the thigh and a follicular erythema of the leg. R. W. Taylor (Jour. Cut. and Gen.-Urin. Dis., vol. xiii, Dec., '95).

On the other hand, it is more bulky, will go farther, and is less likely to cake than iodoform. Its properties are those of an antiseptic, antisyphilitic, and alterative. It exerts a kolyseptic action upon micro-organic growth.

Therapeutics.—Europhen is not generally given by the mouth, although it has been administered in syphilis, in doses of ½ to 2 grains. It is not considered poisonous; as much as 23 grains has been taken daily for three weeks without any appreciable disturbance. It is believed that europhen taken inter-

nally passes through the bowels almost unchanged. The hypodermic use of europhen has not met with much favor, and, although tried in the treatment of syphilis, it has not yielded the results anticipated. As a surgical dressing and in some cutaneous disorders, principally those presenting moist or secreting surfaces, europhen has found great favor.

WOUNDS.—In recent wounds of traumatic origin europhen has proved of great usefulness, showing a high efficiency as an antiseptic dressing. Great drying powers without local irritation and absence of odor are the principal advantage of europhen over iodoform. All kinds of wounds heal quickly under it. It has been used with great success after superficial operations, such as removal of skin tumors, circumcision, and cauterization. In post-operative fistulæ it has been found better than iodoform. Erosions, fissures, and sinuses may be dusted with europhen and then covered with 10-per-cent. europhen gauze.

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Europhen recommended as the best substitute for iodoform; it does not irritate inflamed skin. In varicose ulcers, with eczema, europhen is of much value, for it has a beneficial effect on the eczema. It may be applied in powder, either alone or mixed with powdered boric acid. As an application in the intertrigo of children the author recommends:—

R Europhen, 1¼ drachms.

Lanolin. anhydr., 1¼ drachms.

Tale. venet., ad 3 ounces.—M.

It is of much value in pustular affections and folliculitis, in the form of a 10-per-cent. ointment with lanolin, as well as in cases of pemphigus vulgaris and impetigo.

It may be used to replace iodoform in the collodion used for sealing up small operation-wounds. Another advantage of this preparation is its power of arresting hæmorrhage, which makes it a use-

ful application after the puncture of acne pustules or the scarification of rosacea. Saalfeld (Lewin's Festschrift, Berlin, '96).

R. Europhen,
Castor-oil, of each, 1 part.
Collodion, 10 parts.

M. To be used as an application to wounds.

De Molènes (Jour. de Méd. de Paris, Feb. 27, '98).

CUTANEOUS DISORDERS.—In skin affections of a dry or scaly character, europhen is inactive, as might be inferred. In dry eczema, favus, and psoriasis its value is slight. As a dusting-powder in the intertrigo of children it has found great favor. In pustular eczema, folliculitis impetigo, suppurating lupus, and scrofuloderma europhen has proved of equal value with iodoform. In scalds and burns and erysipelas it is of considerable service, a dressing of 3 parts of europhen in 7 parts of olive-oil being suggested. In chronic, indolent ulcers and in leg ulcers with a surrounding eczematous area europhen soothes the burning and itching, and allays the pain, whereas iodoform is irritating. Boils and carbuncles are dressed successfully with europhen. In the treatment of tubercular growths europhen is inferior to iodoform.

VENEREAL DISORDERS.—Europhen is a valuable dressing for balanitis, chancre, suppurations, buboes, and phagedenic ulcers, as well as for tertiary syphilitic conditions affecting mucous surfaces, or with a moist or secreting surface. Europhen may be applied, as in other surgical cases, in powder, ointment, oily solution, or in the form of gauze, as the nature of the case requires.

NASAL DISORDERS.—In atrophic rhinitis, ozæna, septal ulceration (syphilitic or traumatic), and in post-operative wounds of the nasal cavities europhen is

very valuable, as it adheres well to the mucous membrane, is devoid of unpleasant odor, and has great antiseptic and healing powers.

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EXALGIN.—Exalgin (methyl-phenyl-acet-amide or methyl-acetanilid) is prepared by warming together menomethyl-aniline and acetyl-chloride. It appears in beautiful acicular needles, which are with difficulty soluble in cold water, more readily in warm water, and more easily in dilute and concentrated alcohol. It is odorless and tasteless.

Doses and Physiological Action.—Exalgin may be given to adults in doses of 2 to 4 grains every two to four hours. A maximal daily dose of 15 grains should not be exceeded.

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Doses of exalgin, as set forth in the various formularies, are too high. The maximum dose for twenty-four hours should be, for a man, 4 grains, and for a woman $2\frac{1}{2}$ grains. M. Bardet (Jour. de Pharm. et de Chim., No. 8, p. 413, '98).

Children from 1 to 12 years of age may be given $\frac{1}{2}$ to $1\frac{1}{2}$ grains three times daily. Owing to its pleasant taste, it may be given dry on the tongue, in wafers, and dissolved in wine or water, to which a little alcohol has been added (exalgin, 1 part; alcohol, $1\frac{1}{4}$ parts; sweetened water, 125 parts).

Sodium salicylate added to exalgin increases its solubility for hypodermic use (exalgin, 10 parts; sodium salicylate, 11 parts; water, 100 parts). In short, the dose of exalgin is one-fifth that of antipyrine.

The physiological action of exalgin is similar to that of acetanilid. It is capable of acting energetically upon sensibil-

ity and the motor nerve-system, and later upon the respiratory and circulatory systems. In tonic doses it acts upon the blood-corpuscles like all poisons of the same class and diminishes the energy of the gaseous changes therein. In animals, mortally tonic doses produce violent convulsions and insensibility; death is from asphyxia. In tonic non-mortal doses convulsions are observed. In man the temperature is not reduced except when exalgin is administered in small, repeated doses during several hours. It acts first upon sensibility; its action upon thermogenesis comes later and is accessory. With feverish patients untoward effects are accentuated; hence the presence of fever is a contra-indication to its use. While large doses in animals do not produce albuminuria or hæmaturia (Brig-onnet), in man the quantity of urine decreases, the color becomes darker, and urobilin and indican are present, if the dose is large. Arterial pressure occasionally falls slightly, though usually there is a rise, with a decrease in pulse-rate. Vasomotor disturbances are indicated by free or profuse diaphoresis.

Exalgin Poisoning.—No fatal poisoning from exalgin has been reported, although serious symptoms have followed so small a dose as 5 grains. In this case, an asthmatic, the effects of this small dose were noticed within five minutes. Unconsciousness was associated with shallow, infrequent, and failing respiration. The lips and finger-tips became cyanosed and the extremities cold; the pupils were fixed and widely dilated; knee-jerks were absent. Later an evident tendency to heart-failure. The urine could be drawn with catheter (secretion suppression). In other cases larger doses have produced numbness and tingling, vertigo, temporary blindness, tinnitus aurium, headache, profuse

sweating, cyanosis followed by pallor, formication, etc. The brain seems to be the first organ affected and the first to recover. General motor paralysis with dyspnœa, pallor, palpitation, and physical prostration were the symptoms in another case. There is sometimes a feeling of alternate expansion and contraction of the head.

Case of poisoning reported by two 3-grain doses of the drug in a boy 14 years of age. The symptoms came on about an hour after the administration of the second dose, and consisted of great dyspnœa, intermittent pulse, and dilatation of the pupils. Recovery took place under hypodermic injections of ether and alcoholic stimulation. The drug is dangerous in large doses, and of no use as an analgesic, in small quantities. E. T. Flynn (Brit. Med. Jour., Jan. 10, '91).

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Case of an arthritic and hysterical woman, who took, for the mitigation of an attack of migraine, a cachet containing 4 grains of exalgin. This dose in a short time produced upon the skin and the mucous membrane of the anus and vagina a general papulose eruption, with patches of a fiery-red color, and, in certain spots, large blisters, containing a clear, serous fluid. The rash, which lasted four days, caused pain when pressure was applied, but it was not pruriginous. Linossier (Jour. de Pharm. et de Chim., No. 8, p. 413, '98).

Treatment of Poisoning.—The first indication in the treatment of exalgin poisoning is to evacuate the stomach. Apomorphine in doses of $\frac{1}{10}$ to $\frac{1}{6}$ grain may be given hypodermically for this purpose. Cardiac and respiratory stimulants (ether, strychnine, and caffeine by hypodermic injection, or strong coffee by the rectum) are then demanded. Morphine by injection may be given if there are convulsions or if much rigidity is present. If the respirations fail, artificial respiration should be kept up faith-

fully, and faradization of the phrenic nerve, stimulants, and warmth applied. In all cases of poisoning thus far reported, these remedies have been successfully used.

Therapeutics.—Exalgin is essentially a remedy against pain, as its name indicates. It is an antineuralgic, antirheumatic, and sedative. It should never be given to patients suffering with any interference of respiration nor used as a means of reducing temperature, for experience has shown that in febrile cases the untoward effects of the drug are marked.

Satisfactory results obtained from the use of the drug as an analgesic in small doses. Arthur Conning Hartley (Lancet, Mar. 7, '91).

Seven cases of various disorders, in which pain was prominent, were markedly relieved by exalgin, the dose of the drug being from 3 to 6 grains. Amelioration was comparatively prompt, and no disagreeable after-effects were observed. C. Ferreira (Med. Abstract, Mar., '91).

Drug used extensively with marked success, in the alleviation of pain, and no disagreeable effects observed. It is unwise to employ the medicament, even in small doses, in patients convalescing from febrile disorders, owing to the weakened condition of the heart. D. Gair Braidwood (Brit. Med. Jour., Jan. 17, '91).

Used externally diluted, as a dusting-powder, exalgin has been found to exert a slight anæsthetic effect on painful ulcers, burns, and injured surfaces.

Exalgin is used to relieve the pain of rheumatism, arthritis, the various forms of neuralgia, headaches, and the lightning pains of locomotor ataxia.

Comparatively large doses of this drug used in the treatment of various kinds of neuralgias, in the lightning pains of locomotor ataxia, and in those of rheumatism. Doses from 4 to 12 grains have produced no unpleasant symptoms, and

when any occurred, such as cyanosis, the duration was short. In some cases as high a dose as 24 grains may be given without producing any cyanosis or other untoward effect. Desnos (Revue Gén. de Clin. et de Thér., Feb. 15, '91).

Small night and morning doses (2 or 3 grains) have been found useful in many cases of epilepsy and chorea, but in these disorders medication must be continued for several weeks to be successful.

In all cases exalgin should be administered in small doses until the susceptibility of the patient is ascertained; thus only will dangerous symptoms be avoided.

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EXOPHTHALMIC GOITRE.—Exophthalmos: Gr., ἐξόφθαλμος, prominent eyes.

Definition.—Exophthalmic goitre, or Graves's disease (called by the Germans Basedow's disease) is a chronic, not self-limited affection, characterized by a great variety of signs and symptoms, the most familiar of which are enlargement of the thyroid gland, prominence of the eyeballs, nervous irritability, muscular tremor, and vasomotor affections of striking character.

Disorders of metabolism and of local nutrition also occur, and many other manifestations, mainly due to disturbances of the nervous functions, although associated with them are certain signs suggesting morphological disorders of growth, and others of myxœdematous-like character.

These signs and symptoms are probably due, for the most part, to a vitiation of the blood by altered and excessive secretion from the thyroid gland, but it is still uncertain whether or not there exist, behind or in conjunction with this disease of the thyroid, some special sus-

ceptibility on the part of the nervous system. It is in favor of the latter view that a portion of the manifestations of the disease seem to reproduce, in morbid caricature, an assemblage of quasiphysiological and related functions ("fright-complex," as suggested by Mackenzie and others).

Varieties.—The attempt has been made by various writers to divide the cases of Graves's disease into a "primary," or pure, form, and a "secondary," or symptomatic, form. The symptoms of the latter variety are supposed to be excited—sometimes singly or in small number—by some special source of peripheral irritation, such as disease of the nose or of the genital or intestinal tract, or—and that pre-eminently—by pre-existing goitre of one or another form acting as a mechanical irritant. This view is untenable except in a very limited sense, and introduces a needless confusion into our conception of the nature and symptomatology of Graves's disease.

It is true that cases are now and then met with where the removal of one or another of these special sources of irritation leads to rapid improvement, just as the relief of errors of refraction occasionally leads to rapid improvement in cases of epilepsy or migraine, but to conclude in either case that the true cause of the disease has been found is to follow a misleading method of reasoning. When the nervous system has been under the tax of bearing several loads at once the removal of any one of them may suffice to communicate a new "set" to the nerve-functions or to provide the amount of relief needed to make recovery possible. It is not even safe to conclude, in such a case, that the special irritation in question was originally the sole or principal *exciting* cause of the disease. The most

that can be inferred is that it was acting, at the moment of its removal, as a considerable cause of nervous instability, either general or local.

"Secondary" cases of Graves's disease are liable to become as severe and as complex as "primary" cases, and when both are fully developed there is no criterion by which we can distinguish between them. Neither is such a criterion furnished by differences in their modes of onset, since in some of the cases which would be designated as "primary" the symptoms come on very slowly, while, on the other hand, in any class of cases a slow progression or incomplete symptom-complex is liable to give place suddenly to a rapid development.

The differences based on mildness or severity, completeness or incompleteness of the clinical picture, etc., although not of radical importance, and not suited to form a basis for classification, are, nevertheless, of great interest. In some cases the symptoms reach in a few days, or even hours, a degree of development for which, in other cases, years had been required. Even a fatal ending may occur in the course of days or weeks.

Some of the characteristics especially calling for study are the following: Those indicating an admixture of a true myxœdematous tendency, such as dry skin, non-pitting œdema, possibly falling of the hair, etc.; those indicating formative, morphological modifications of growths, as slenderness of the fingers and suppleness of the joints.

Another point needing investigation is how far the analogy holds good between Graves's disease and the complex of symptoms met with in fright and kindred states. These states may be spoken of as quasiphysiological, but are, in fact, pathological.

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Peculiarities of the disease as affecting children; from an analysis of forty-four cases: The symptoms reach their maximum more rapidly in children than in adults; palpitation does not come on so quickly as with adults; thyroid enlargement is always present in children; the exophthalmos is less marked and the eye-muscle symptoms are much less common or severe; choreiform movements are often present, probably as a complication; hysterical symptoms are well marked in some cases. On the whole, the disease is less severe in children. Myxœdema may supervene even with children. Steiner (Wiener med. Bl., p. 91, '97).

Symptoms.—Enlargement of the thyroid usually begins at about the same period with the appearance of the other symptoms, but sometimes much earlier or later. The right lobe is commonly more prominent than the left. Vascular (arterial) murmurs of “swirling” character, obtained by auscultation directly over the gland, are probably pathognomonic when present, but are not always heard; or they may be heard over limited areas. It is doubtful whether enlargements attended with this special vascular murmur—*i.e.*, enlargements of the specific Graves’s-disease character—are ever present for long without other symptoms. This murmur is to be distinguished from the “hum” due to compression of the cervical veins. When one lobe of the thyroid is more enlarged than the other and one eye is also more prominent, there is usually a concurrence as regards right or left side; but marked exceptions to this rule occur, and should be noted. In spite of the presence of these murmurs, and in spite of the fact that the gland is capable of swelling with great rapidity, arterial dilatation is not a marked feature of the post-mortem changes. The characteristic disease con-

sists in changes in form and arrangement of the secreting cells and alteration of the secretion, the exact nature of which latter is not known. This is usually, but perhaps not invariably, attended by enlargement.

From whatever point of view we regard Graves’s disease,—*i.e.*, whether as a toxic affection or as a neurosis,—it is clear that the main part of the signs and symptoms, even many of those which are ostensibly limited to other tissues and organs, are referable to disorders of function or, eventually, of nutrition, of the nervous system.

A mild grade of multiple neuritis is an almost constant accompaniment of Graves’s disease, and many of the well-known symptoms are due to this complication. Maude (Brain, Summer ed., p. 229, '94).

The symptom of exophthalmic goitre indicates a mode of dissolution of the nervous system, and is a degenerative neurosis making a line of cleavage at some point at which the nervous functions are exposed to the strain. Putnam (Boston Med. and Surg. Jour., Aug., '95).

The mental symptoms are excitability; restlessness, often of an agitated character; capriciousness; depression, or, on the contrary, an unnatural gaiety, with an apparent incapacity to appreciate the gravity of the situation; delirium, either in terminal stages of the disease or occurring in paroxysms during its course; typical insanity, and degenerative affections of the brain.

To account for these phenomena we can invoke the influences associated with the disease itself, the neuropathic tendencies of the patients, the exhaustion from the sickness, and concurrent influences. In other words, the mental changes may be of parallel significance with the other signs of the disease, or may be only its accompaniments and secondary results; and, the more “spe-

cific" their character, the more likely it is that they are essential phenomena of the affection. However the mental symptoms arise, their presence is unfavorable, as increasing the patient's emotional instability.

Among the psychoses observed are oversensitive notion of duty and incoherence of ideas. A. Maude (Brit. Med. Jour., Oct. 21, '93).

Since a certain proportion of cases finally become insane, the indication is to place around such patients the same prophylactic precautions which are necessary in cases having an hereditary predisposition to insanity. C. M. Hay (Med. Age, June 10, '91).

Changed mental state in cases of Graves's disease noted, especially motor restlessness, which sometimes almost imitates a chorea, and which is present in subacute mania and neurasthenia. Its value is that it expresses their mental attitude as well. They are very subject to fright—often have hallucinations of sight and sometimes of hearing. The memory is usually much impaired. Their mental processes are fragmentary. They have no fixity of attention, and often present a distinct tendency to melancholia. Hysteria and the psychical changes of hysteria are frequently present among them, and in rare cases the disease is marked by the development of acute mania. Maude (Med. Press, Sept. 4, '95).

Polydipsia, excessive thirst, ravenous desire for food, and other morbid sensations of this complex sort are classifiable here. The sexual feelings are often below the normal.

Epilepsy, hysteria, chorea, and paralytic agitans may complicate Graves's disease, and in the case of the former two affections, especially of epilepsy, the connection seems particularly close, so close that epileptic attacks are thought by some observers to belong to the specific symptomatology.

[A patient with Graves's disease under my own care, a lady of 30, has had seri-

ous attacks for many years, some of which have seemed positively epileptic, others at least in great part hysterical. The diagnosis of hysteria has seemed strengthened by the fact that the seizures usually come on when she hears music, so that she has given up the piano altogether, although previously devoted to it, and shuns hearing others play. JAMES J. PUTNAM.]

Hysteria and its hallucinations form the material out of which ideas of persecution are created in exophthalmic goitre. Ballet (Jour. of Nervous and Mental Dis., July, '90).

It would be premature to assume that the toxic agent at work directly excites the convulsions. This is possible, but it is more probable that the epilepsy is associated with Graves's disease just as it may be associated with migraine or with tabes. A tissue-poison of some sort, not necessarily that which is found in the thyroid, may act as the exciting cause.

Local cramps and muscular spasms are of occasional occurrence. It is not known whether they are of central or of peripheral origin.

Tremor is almost, though not absolutely, universally present. It is fine and rapid, and usually involves the hands alone, though sometimes also the head and other parts.

The tremor of Graves's disease is most marked in the hands, and may be confined to them. Other muscles most often affected are the pectorals, serratus magnus, and erector spinæ. If the tremor is well marked in any group of muscles, it is sure to be general over the whole body to some degree. Placing the hands on the patient's shoulders when he is standing will detect even very slight tremor. Maude (Brain, Autumn, Winter, '92).

Choreiform twitchings are also common, suggesting the fine, jerky movements of many young girls of nervous temperament.

The voice in Graves's disease is occa-

sionally stridulous, weak, high pitched, and tremulous, but one should not too hastily refer this to localized lesions causing paresis of the vocal cords. This, too, may occur, but the peculiar change of voice is, perhaps, a phenomenon of more subtle character.

Localized paralyses and atrophies belong to the rarer signs. The paralyses are analogous in general characters to those met with in tabes. In both cases there may be either transitory or relatively permanent loss of power in the muscles supplied by cranial nerves, especially the eye-muscles, and those of the face and the larynx; while the sudden, functional paraplegias of tabes are, perhaps, analogous to the "giving way of the legs" in Graves's disease.

The following symptoms may occur besides the classical trio: Elevation of temperature of one or two degrees (the urine presenting no febrile character); muscular trembling constant, uniform, uninfluenced by voluntary movements (the myograph shows eight or nine oscillations a second, the most rapid type of trembling known); sensation of warmth; giving way of the legs (mild paraplegia) without spasmodic phenomena or lancinating pains. Charcot (*Le Bull. Méd.*, Feb. 3, '89).

The paraplegia at times associated with Graves's disease is due to a lumbar myelitis, and trembling to a mild inflammatory process extending to the cervical and dorsal cord. These are the result of a toxic substance in the blood from disturbance of the thyroid function. The influence of a neuropathic constitution is not excluded by this assumption. Angiolella (*Boletino de Med. Naval, Madrid, Fasc. 1, '93*).

One might expect that the muscles which are most prone to show weakness would be the ones most likely to become paralyzed, but this is apparently not borne out by experience. The movement of the eyes which is most often defective in Graves's disease is convergence, but

paralysis may affect the external recti as well as the internal. The explanation for this discrepancy lies partly in the fact that the disorders of movement such as underlie the impairment of convergence and change of voice, which sometimes show themselves as impairing the consensual lateral movements of the two eyes, are due, partly at least, not to localized lesions, but to central disorders of co-ordination (Sattler).

Hemiplegia may occur in a curable form, not due to hæmorrhage and perhaps analogous to hysterical hemiplegia.

Muscular atrophy, of the spinal type, rarely reaching a high degree, affecting pre-eminently the intrinsic hand-muscles, with quantitative electrical changes, and susceptible of cure, may occur. Only one typical case of this sort has come within my personal observation. This case was in all respects severe, but ended in almost complete recovery. This patient found great difficulty in rising from a chair and mounting the stairs, and the gait was a high degree of waddling character.

I have, however, seen several patients who exhibited great difficulty in rising from the chair or mounting stairs, and perhaps careful search would have revealed diffuse or localized atrophy as a cause.

Cardiac signs: tachycardia, not easily controlled by digitalis, excitability, often irregularity, and palpitation are the common signs. Secondary dilatation is frequent, and with it loud systolic murmurs. True endocarditis is not characteristic, and even conditions which seem serious may disappear if the progress of the case is otherwise favorable. The pulse-rate frequently reaches 150, occasionally 200 or more, especially during attacks of palpitation. These attacks can occur without apparent cause often at night, and

be of alarming severity and cause terrible distress, though in fact death rarely occurs in them. Möbius suggests that the apparently-causeless occurrence of these seizures marks them as probably of toxic origin; but if this is sound reasoning it must be extended to embrace many cases of tachycardia in neurasthenia and hysteria.

Vasomotor system. Flushing and high vascularity of the skin, "dermatography," and pulsation of the larger arteries, especially the carotids are very common. Less often noted, but calling for further study, are pulsation of the abdominal organs and vascular dilatation confined to localized areas.

Attention called to the pulsation of the spleen and liver, which has been observed in a number of cases: a phenomenon of importance in distinguishing between mitral insufficiency and Basedow's disease. C. Gerhardt (*Mittheilungen aus den Grenzgebieten der Med. und Chir.*, B. I, H. 2).

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Attention called to the distended condition of the arteries of the body generally in this disease, especially the aortic branches; similar conditions found in the arteries of the extremities as in the palmar arches and crurals. Capillary pulsation noted and pulsation of the spleen, liver, and even of the kidneys. Gerhardt (*Centralb. f. Chir.*, Sept. 5, '96).

The radial pulse may feel weak and thready when the carotids are beating strongly. The dilatations are due to influences acting on the affected portions of the blood-vessels, and not to general increase of blood-pressure, which does not, in fact, occur. Arterial pulsation may be seen in the fundus of the eye, but this sign, as well as tortuosity of the veins near the disk, is often looked for in vain. Local gangrene has occasionally been noted.

Œdemas occur, sometimes due to localized circulatory changes, sometimes to cardiac weakness, sometimes, perhaps, to a myxœdematous tendency, and sometimes to unknown causes. The eyelids, one or both, are prone to this œdema, and may remain affected very obstinately.

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Case of Graves's disease characterized by the presence of a rather rare symptom: œdema of the eyelids. J. Arthur Booth (*Jour. of Nervous and Mental Disease*, Feb., '96).

Albuminuria, which is usually transitory, may occur and should be watched for. General œdema, not due to cardiac weakness, may be a striking feature of early stages of the disease (Mackenzie). A non-pitting œdema of the legs or of the abdominal walls may occur, suggesting myxœdematous œdema, but not influenced by thyroid treatment.

Œdema is not always of grave significance. It may be developed in the absence of any cachetic condition or valvular lesion. Vasomotor-innervation troubles, permanent or transitory dilatations of the heart or its enfeeblement, anæmia, and chlorosis are the conditions which favor its development. Millard (*Thèse de Paris*, '88).

Literature of '96-'97-'98.

Slight œdema limited to the legs is not an unfrequent accompaniment of exophthalmic goitre. This results from cardiac weakness, and is best met by the administration of cardiac tonics; a general œdema may be one of the main features of the early stage of the disease, and is not necessarily an unfavorable sign; general œdema may supervene before death. Swelling of the eyelids may be an early symptom, or it may come on after some years. Sometimes a non-pitting swelling is met with, affecting the lower extremities, resembling the swelling of myxœdema. This swelling is, however, unaffected by thyroid treatment. H. Mac-

kenzie (*Edinburgh Med. Jour.*, 401-410, Apr., '97).

There are but four varieties of œdema of the limbs in thyreo-exophthalmic neurosis: œdema of cardiac origin, dyscratic œdema, œdema coincident with albuminuria (this being independent of the well-known parenchymatous or glomerular lesions of the kidneys), and œdema of vasomotor origin. (œdema of cardiac origin may be paroxysmal. In well-established cases of œdema of the legs by asystole, when the impulse of the overtaxed heart is suddenly weakened and the tension of the radial pulse is suddenly lowered, digitalis excels; it is still more excellent when the œdema follows definitive organic alterations of the muscle, of the cardiac valves, and of the aorta; apart from that, it should be banished from the treatment of exophthalmic goitre.

By dyscratic œdema of the limbs in exophthalmic goitre is meant that which is coincident in many cases of the disease with chlorosis, or with anæmia engendered by chronic metritis, with leucorrhœa, amenorrhœa, or dysmenorrhœa, or following pregnancy, nursing, or puerperal hæmorrhages; in the two sexes, following sexual abuse, diarrhœa, or protracted illness, or privations. In the form of exophthalmic goitre due to these causes, in which the pulse does not usually exceed 100 or 110, and the pulsatile goitre and the protrusion of the eyes are but moderately developed, in which the neurosis occurs with symptoms of torpor, soft œdema of the feet and of the lower part of the legs is common after walking and riding, or it becomes established for several weeks in the legs without the presence of albumin in the urine or dilatation of the heart. Infusions of pure bitters, milk, rare meats, and raw meat should be recommended at first; if this is not sufficient, arsenic should be resorted to. (œdema of the limbs is not observed whenever chemical analysis reveals the presence of albumin in the urine in exophthalmic goitre. It never exists when albumin, not very abundant, however, is not observed except during the digestive period. Liégeois (*Jour. des Praticiens*, Aug. 7, '97).

Maude has described fugitive puffy swellings as occurring in various parts, as the face, neck, arms, etc.

Irregular and inadequate innervation of the circulatory system undoubtedly accentuates or causes other disturbances, such as the diarrhœa, the sweating, the exophthalmos, the epistaxis, and other hæmorrhages from the mucous membranes. It must not, however, be forgotten that if it be true that a poison is circulating with the blood, the irritation attending its elimination might help to account for some of the affections of the various secreting surfaces: the skin, the bowels, and the kidneys, as well as of the organs concerned in primary metabolism. Still more must it be remembered that the real explanation of many of the constantly recurring—so to speak—specific signs of this disease is probably far more subtle than our conceptions can now fathom.

Not only are dyspnœa and a sense of suffocation present during attacks of palpitation, but a diminished inspiratory capacity is sometimes to be noted, as an early symptom and throughout the illness.

Stress laid on diminished chest-expansion (found in all cases observed). Chest-expansion of 1 inch or more is considered sufficient ground for favorable prognosis. Louise Fiske Bryson (*N. Y. Med. Jour.*, Dec. 14, '89).

Forty cases of exophthalmic goitre examined. There was an average diminution of chest-expansion, but this was dependent upon, and in the individual cases more or less proportionate to, the amount of general muscular weakness. Patrick (*N. Y. Med. Jour.*, Feb. 9, '95).

The typical paralyses of the eye-muscles have already been referred to as among the affections of the nervous system.

In two cases an involuntary flow of tears observed as the first symptom of

exophthalmic goitre. E. Berger (Le Bull. Méd., Mar. 15, '93).

Besides these, the most characteristic signs are retraction of the lids (Stellwag's sign), exophthalmos, and the impairment of the power of convergence. Graefe's sign (lagging of the upper lid when the globe moves downward) and impairment of the wink-reflex are directly traceable to the retraction of the upper lid.

Exophthalmos is late to appear and marks the height of the disease. Von Graefe's sign commonly appears before the exophthalmos. J. M. Taylor (Med. and Surg. Reporter, Apr. 14, '88).

Graefe's lid-symptom found in 12 out of 613 patients of all kinds. People in health can, not infrequently, cause it by staring. As it often fails in exophthalmic goitre, its diagnostic importance is not great. Sharkey (Brit. Med. Jour., Oct. 25, '90).

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The two chief abnormal variations in movements of the eyelids are von Graefe's sign—the eyelid descending not synchronously with the descending globe, but more slowly and, it may be, more jerkily—and Stellwag's sign, consisting in retraction of lids and consequent increase in the width of the palpebral fissure. This retraction is most obvious in the upper lids and is frequently associated, as is seen when the patient's gaze is directed downward, with a cupping of the lower lid. Both these signs are quite independent of exophthalmos, and their clinical value is difficult to estimate. They are neither constant nor pathognomonic, and are variable even in the same person. Von Graefe ascribed the deranged movement to spasm of the fibres of Müller. More recently Ferri has advanced the theory that the retraction of the lid is the result of the mechanical shortening of the levator palpebræ due to the increased volume of blood-vessels distributed in its substance. The writer leans to the theory that these states are due to an affection of the oculomotor nucleus and a consequent paresis of the

upper facial group of muscles. A. Maude (Edinburgh Med. Jour., July, '97).

Case of exophthalmic goitre observed with typical heart and thyroid symptoms, but with only unilateral exophthalmos. This was the third case the author had seen. Hinshelwood (Edinburgh Med. Jour., May, '98).

Retraction of the lid may be present without exophthalmos, the staring appearance giving a false impression of protrusion. The lid-signs may vary in intensity from day to day. The protrusion itself is generally present in greater or less degree, sometimes, though very rarely, to such an extent that the eye is nearly or quite dislocated from the socket, yet the movements of the globes remain consensual and double vision is not characteristic.

In about 20 cases of exophthalmic goitre a limitation of the field of vision observed, which fluctuates with the variations other symptoms show. Kast and Wilbrand (Neurol. Centralb., July 15, '90).

Limitation of the field of vision does not belong to the clinical picture of exophthalmic goitre, and its presence, in the absence of material lesions of the brain, fundus or media of the eye, should suggest the co-existence of hysteria. Soucques (La Semaine Méd., May 20, '91).

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Case of exophthalmic goitre in a maid-servant, 21 years old, in whom the protrusion of the eyes was so great and the inability to close the lids so long-continued that both corneas ulcerated through, and removal of both eyes became necessary, after which the general condition of the patient improved greatly. Griffith (Brit. Med. Jour., Aug. 20, '98).

The protrusion may come on rapidly and may subside as rapidly, showing that it is due to congestion, perhaps associated with muscular relaxation. Later, it becomes fixed and is referable in part to

accumulation of fat in the orbit. It is often greater on one side than the other, the right lobe being usually the more prominent. The right lobe of the thyroid, as has already been noted, is likewise usually more prominent than the left, and the conclusion almost forces itself on the mind that the two phenomena are in some way related. It occasionally happens, however, that the larger lobe of the thyroid and the more protruding eye are on opposite sides. The failure of the lids to cover the eyeball prepares the way for ulcerations of the cornea, though it seems probable that the other influences come in, since the exposure alone is not always a sufficient explanation.

Sensory disorders are not characteristic except those which are related to the general feelings of malaise. Many others occur in individual cases, but they are largely signs of concomitant neuroses.

Patients with acute Graves's disease usually grow thin and weak, while excess of phosphates and urea appear in the urine. On the other hand, in mild or even in rather serious cases the weight may remain unchanged or may even increase.

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An interesting symptom in Graves's disease is rapid loss of weight occurring intermittently. Huchard (Jour. de Méd., Feb. 10, '96).

It is worthy of note in this connection that obesity, in otherwise-healthy persons, is not always overcome by thyroid preparations, and that different persons react very differently as regards loss of weight. Toward the close of life in fatal cases, and even at an earlier period, a sort of cachexia may come on which obstinately resists treatment.

Alimentary glycosuria, characterized by the appearance of sugar in the urine

within a few hours after taking grape-sugar or glucose (the usual test-dose being 100 grammes) is relatively common among patients with Graves's disease, though this peculiarity is shared by the subjects of various other neuroses.

True diabetes mellitus is also perhaps relatively common among them, though, in fact, rare.

Feverishness (increased internal temperature) may be present during acute stages, but by no means in proportion to the sense of heat.

Icterus, salivation, and digestive disorders occur, though rarely, except for the *diarrhœa*, which will be referred to separately.

Diseases of the gastro-intestinal tract, diarrhœa, and vomiting belong to the symptomatology of Graves's disease, the former being especially common. The diarrhœa is usually not due to fermentative changes, but to anomalies of secretion and peristaltic action, either based upon disorders of innervation or indicating the elimination by the intestine of some toxic substance. Sometimes the stools are simply liquid, sometimes they are peculiar in character. Cholesterin has been found in considerable quantity, and in the case of a patient of mine a number of whitish masses were excreted, the character of which was not ascertained. Sometimes the stools are bloody, and in this and other respects one is reminded of the other forms of hysterical or "nervous" diarrhœa, which are so common. The hypersecretion is not much affected by opium.

Paroxysmal attacks of diarrhœa common. Another digestive symptom is boulimia. Diarrhœa may be an early symptom in rapidly-developing case. A. Maude (London Practitioner, Sept., '91).

Vomiting may occur in attacks suggesting those of tabes, but usually without pain.

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Case observed in which the disease ran an unusually-rapid course, as the patient lived just three months after the symptoms first made themselves apparent. The most important and obstinate symptom was vomiting and distressing retching at even the sight of food. Sutcliffe (*Lancet*, Mar. 12, '98).

Signs of impaired local nutrition may be present in the form of swellings of the joints, as of the fingers, ulcerations of the cornea,—due partly, but not wholly, to exposure arising from the wide lid-openings,—and various affections of the skin and its appendages,—as vitiligo, pigmentation, falling of the hair, inflammation about the nails, scleroderma, sweating, erythema, urticaria, and leucoderma.

Pigmentary changes in the skin observed in five patients. The color is a more or less dark brown; the parts affected are the face, neck, sides of chest, abdomen, lumbar region, axillæ, and flexures of arms and thighs. H. W. G. Mackenzie (*Lancet*, Sept. 13, '90).

Literature of '96-'97-'98.

Case observed in which complete alopecia was associated with exophthalmic goitre. Berliner (*Monats. f. prak. der Med.*, vol. xxiii, No. 2, '96).

The fingers may become tapering and very movable in their articulations. It is possible that changes of this character, and others met with in Graves's disease, indicate changes in morphological tendencies of growth such as occur in myxœdema and after castration.

The spleen and lymph-glands may become enlarged to the point of lymphadenoma (Gowers). The thymus is often persistent.

The uterus and the breasts—one or both—may atrophy prematurely, or, on the other hand, the breasts may enlarge. Basedow reported a case of this sort in a man.

The bones may become soft and it is said (Revilliod) that symptoms like those of Graves's disease may occur in osteomalacia.

Myxœdematous changes occur as a sequel to the thyroid atrophy which may follow the Graves-disease degeneration of the thyroid gland. Whether myxœdema and Graves's disease may truly be said to coincide is an open question, though various cases have been reported which indicate that this is possible. Confirmatory evidence should be carefully noted and critically studied. The sorts of myxœdematous changes most likely to occur are non-pitting œdema, supraclavicular swellings, scleroderma, falling of the hair, mental dullness, atrophy of the breasts, disease of the bones and joints, dryness of the skin.

Diagnosis.—There is no difficulty in the diagnosis of a typical case of Graves's disease. On the other hand, in the early stages of very mild cases one may be able to do no more than suspect the presence of the trouble; yet this suspicion may be of great practical importance. There is, perhaps, no single symptom which may not be absent or so inconspicuous as not to challenge attention. Even the rapid pulse may, perhaps, be lacking. This is extremely rare, but pulse-rates of about ninety are not very uncommon. Persistent tachycardia of any grade, persistent nervousness, agitation, and tremor, not associated with typical signs of neurasthenia or hysteria, or out of proportion to those signs, persistent—even if slight—suffusion of the face, and causeless diarrhœa should always awaken suspicion, and if the patient has had an indolent goitre for some years or has been recently exposed to severe emotional excitement or any of the other exciting causes of Graves's disease, there will be all the more reason for thinking that the

suspicion is well grounded. High temperature, sweating, and loss of flesh, would all be confirmatory indications, but the presence of well-marked signs of hysteria or neurasthenia might, in the absence of an enlargement of the thyroid, offer another and sufficient explanation. The diagnosis of what might be called the *stage of predisposition*—in which, of course, no positive symptom would be manifest, or only occasionally manifest—is perhaps impossible at the present day. Nevertheless, by the aid of careful observation some degree of success may at some future time be attempted.

In Graves's disease the body-resistance to the passage of the electrical current is lowered in a remarkable manner: a point to which Charcot was first to draw attention. This peculiarity ascribed to the diminished resistance of the vasomotor dilatation of the skin-capillaries, which thus render the skin saturated with fluid, and practically reduce the thickness of the ill-conducting epidermis to a minimum. R. Norris Wolfenden (Med. Abstract, Jan., '88).

Low electrical resistance is frequently found in Graves's disease. In doubtful cases it is a valuable positive sign, but its absence in such cases has no weight. A. Eulenberg (Berliner klin. Woch., Jan. 14, '89).

Diminished electrical resistance found in 15 out of 20 cases of exophthalmic goitre. But this sign is worthless for diagnosis, as the electrical resistance varies with the moisture of the skin. The resistance greatly lessens when the skin perspires. Volkel ("Ueber einseitigen Exophthalmus bei Morbus Basedowii," '90).

Diagnosis of Graves's disease may be made when delirium cordis and tremor are present, but not without these, all other symptoms being secondary and comparatively unimportant. Lemke (Deut. med. Woch., Dec. 20, '94).

Under PATHOLOGY I will indicate the grounds for thinking that the thyroid

secretion may play a certain part in the quasiphysiological phenomena which fall within the bounds of ordinary health, and if this is true much light may be expected from the further analysis of these states.

Etiology.—Graves's disease is found among men and among women, and even among animals; and may occur in childhood,—even infancy,—in adolescence, in adult life, and rarely in old age. It is, however, far more common among women than among men, and almost always shows itself first during early adult life.

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Graves's disease is very rare in children, twenty-four cases only having been reported. Most of these reported cases occurred in girls, the average age varying from 8 to 13. One case was recorded at the age of 2½ years. In many the exciting cause was unknown; in some the cause seemed to have been a sudden shock. The writer adds two more cases of Graves's disease occurring in children.

Tremor and Graefe's system are generally absent in children, but chorea often forms a complication. The prognosis in children is not unfavorable, some recovering completely, and others only having slight exophthalmos subsequently. Dreschfeld (Practitioner, Aug., '96).

Oxophthalmic goitre occurs approximately 4.5 times as often in females as in males; the disease is most common during the period of active adult life, occurring earlier in females than in males; the disease is uncommon, if not rare, in the black race. A. A. Eshner (Inter. Med. Mag., Apr., '98).

No race is wholly exempt, nor the inhabitants of any special country, and none are very much more prone to the disease than the others. Every now and then the claim is made that it is especially common in one or another place or section of country, but this is not

borne out by prolonged investigation and is probably an example of the accidental coincidences in which the history of medicine abounds. On the other hand, there is rather more reason to think that Graves's disease is more common in districts where simple goitre is endemic. If this prove true the fact would harmonize with the observation that the special kind of goitrous affection met with in Graves's disease is more likely to occur on a basis of thyroid disease of other sorts than on a basis of health. On the other hand, this relative frequency of Graves's disease in goitrous districts is not so great as would probably be the case if simple goitre acted by mechanical irritation.

Forty cases of Graves's disease collected in 15 families. Heredity is probably the predisposing cause in all cases. R. G. Curtin (Trans. Amer. Climatological Assoc., Sept., '88).

Development of the disease requires two factors: first, a functional anomaly of the thyroid gland, and, second, a neuropathic condition, either hereditary or developed through fright or trouble. Müller (University Med. Magazine, Sept., '93).

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Group of cases showing the complexity of relationship between ordinary goitre and Graves's disease, and likewise as an example of family tendency. A mother and three daughters were afflicted as follows: The mother had goitre, with difficulty of breathing; the oldest daughter had goitre without nervous symptoms; the next daughter had complete Graves's disease, following strong emotion and beginning with an attack of cardiac deficiency; the third daughter had a mild form of typical Graves's disease without apparent cause. Soltas (France Méd., Aug. 14, '96).

Graves's disease is hereditary. The marriage of those having such an inheritance should be discouraged. A person who is known to have such an inheri-

tance should reside at an elevation of more than 500 feet. They should avoid great excitement or any highly-exciting occupation. They should not reside in a limestone region nor in a malarial district. They should be careful to avoid all those things that are likely to produce anæmia; should avoid excessive study, any prolonged mental or sexual strain, or anything which can bring on a neurasthenic condition. R. G. Curtin (Internat. Clinics, vol. iv, Series vi, p. 78, '97).

Neurotic heredity and emotional excitement considered the most important of the predisposing causes. Valençon (Gaz. des Hôp., June 19, '97).

There can be no doubt but that Graves's disease is more common in neuropathic families and among neuropathic persons than in connection with sound health, and it is equally certain that it often develops rapidly after exposure to fright, prolonged anxiety or excitement, profound grief, or after physiological strains such as draw strongly on the resources of the nervous system.

Neurosis is the only satisfactory conception of the disease. Leflaive (Gaz. des Hôp., Jan. 12, '89).

Fright seems to be an etiological factor. The disease is a widely-distributed derangement of the emotional nervous system, but alteration in function of the thyroid has much to do with many of the secondary symptoms. H. W. G. Mackenzie (Lancet, Sept. 20, '90).

Exophthalmic goitre considered a branch of the neuropathic and closely related to the arthritic family. Charcot (Schmidt's Jahrbücher, Feb., '91).

The tachycardia is due to an affection of the nucleus of the vagus, struma and exophthalmos being dependent on the tachycardia. The cause of the disease is an intoxication of the nervous system by products of the thyroid. Chevalier (Neurol. Centralb., Sept., '91).

The approximate cause of Graves's disease is probably abnormal action of the thyroid gland. The conditions favoring the development are: female sex, neuropathic state, climatic conditions,

all causes diminishing the resistance of the organism, and especially mental shock. Möbius (Med. Chronicle, July, '92).

Exophthalmic goitre considered a general neurosis, having at times spinal, bulbar, and cerebral symptoms. It can precede, follow, alternate with, or accompany other manifestations of mental degeneration. The psychical troubles of exophthalmic goitre do not form an integral part of the affection. Their association with this affection is the result of the hereditary condition from which they both arise. Exophthalmic goitre is a pons-medullar neurosis, consisting in the exaggeration and permanence of the physiological phenomena of emotion. Raymond and Sérieux (La Semaine Méd., Aug. 10, '92).

Only an organic lesion of the central nervous system can explain all symptoms. P. Mannheim (Schmidt's Jahrbücher, Feb. 15, '94).

Direct pressure of the goitre on the sympathetic or a reflex action through a disturbance of the nerve-filaments of the sympathetic in the thyroid causes the exophthalmos and the tachycardia. It is probable that the atypical nervous symptoms are a result of a general intoxication of the body by chemical products formed in the pathological thyroid. T. Wette (Deut. med. Zeit., Mar. 23, '93).

Strong emotional disturbances are the most common causes of this disease. These affect the brain in such a way that vascular disturbances result. Sooner or later substances are set free in the blood, perhaps largely from the enlarged and overnourished thyroid, and these cause a principal part of the other symptoms, as, for example, the nervous ones. So it is easy to understand how removal of the gland frequently causes improvement, evidently without removing the disease, nor is it likely that organic changes can be found in the brain in a disease of this kind. C. Gerhardt (Mittheilungen aus den Grenzgebieten der Med. u. Chir., B. 1, H. 2).

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The majority of the symptoms are traceable to some lesion of the sympathetic nervous system. Some are the

result of irritation along the sympathetic, while others are due to paralysis of the sympathetic. William C. Krauss (Buffalo Med. Jour., May, '96).

Exophthalmic goitre is best explained by a general toxæmia of the nervous system, the result of quantitative or qualitative changes, or both, in the secretion of the thyroid gland. Probably the existence of another factor is also necessary: *i.e.*, the neurotic predisposition. F. Kinncutt (Med. Rec., Apr. 18, '96).

Among the causes of this order are influences associated with *pregnancy and childbirth*. It has, to be sure, been thought that another explanation was nearer,—namely, that based on some special relationship between the functions of the thyroid and those of the generative organs,—but as somewhat against this is the fact that there is no close correlation between the special phases of the uterine disturbance and the thyroid disease. Both pregnancy and childbirth may excite or aggravate or, on the other hand, lessen the symptoms of exophthalmic goitre.

In certain subjects who are predisposed to morbus Basedowii it may result from pathological conditions of the pelvic organs, while, conversely, disturbances of these organs may be directly due to the disease itself. Young women with Basedow's disease should be advised not to marry, while the married are warned that the course of the disease may be unfavorably affected by pregnancy and the puerperium, and that the children which they bear are likely to be highly neurotic. Theilhaber (Arch. f. Gynäk., B. 48, H. 3, '95).

Attention called to the very intimate relation which exists between the menopause and pathological conditions of the uterus and Basedow's disease. In this relationship exophthalmic goitre placed in the position of an effect or consequence, and not the cause, of the uterine condition. An improvement in the local condition is always followed by the appearance of the general disease. Jouin

(Nouv. Arch. d'Obstét. et de Gynéc., No. 6, '95).

How do emotional excitements and quasiphysiological strains and neuropathic tendencies act in inducing Graves's disease? Are they to be classed as exciting or as predisposing causes; or is there no real difference, here, between excitation and predisposition in this connection? The extreme advocates of the thyroid (toxic) theory assume that in all cases of relatively-sudden outbreak a certain degree of this special form of thyroid disease or at least of impaired power of resistance to disease was already present, and that the causes mentioned act by increasing the instability of equilibrium of the nervous system and so making it react in such a way to the thyroïdal poison as to increase in its turn the thyroid disease. The thyroid disease could not, it is thought, be caused by a nervous influence, such as fright, even combined with that of neuropathic predisposition. But the truth is that in exercising our ingenuity over explanations of this sort, which involve assumptions that may or may not be true, we are apt to forget that the conditions may really be far more subtle than we conceive them. For the present the important thing to remember is the broad fact that nervous perturbations do at times bring on the signs of the disease in a remarkably-rapid manner, and that so far as one can tell it is not necessary in such cases that antecedent thyroïdal disease should have been present. We are as ignorant of the real mode of action of the emotional cause as we are in the case of chorea or of paralysis agitans. We cannot deny that some special predisposition may exist in a latent form in all these cases, and should admit that the discovery of its presence would simplify the problem, since otherwise it is not easy to see why an influence so common

as that of emotional excitement should produce in different cases such diverse effects. I would only, in addition, foreshadow a theory which will be explained below at greater length: namely, that there is not only a relation of cause and effect between a special form of thyroid disease and the other signs and symptoms of exophthalmic goitre, but also a close correlation between the thyroid functions and certain special nervous functions in health. If this is so it is easier to understand how certain particular kinds of irritation should more frequently act as causes for Graves's disease than other irritations apparently of equal severity.

The secretion of the thyroid is exaggerated and probably altered. R. W. Briggs (Edinburgh Med. Jour., Feb., '93).

Graves's disease considered a disease of the thyroid rather than of the nervous system. W. S. Greenfield (Brit. Med. Jour., Dec. 9, '93).

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Exophthalmic goitre in its various degrees results from a perversion of the function of the thyroid gland. Horsley (Brit. Med. Jour., Dec. 5, '96).

Graves's disease results from some form of specific muscle-poisoning produced by the thyroid gland. Lemke (Münch. med. Woch., No. 15, '96).

Chlorosis has been frequently assigned as a cause of Graves's disease, and indeed the two affections are often enough seen in conjunction. But the fact that so careful a student of chlorosis as Van Noorden asserts that he has not been able to detect any such relationship shows that it cannot be a very important one. On the other hand, the impossibility, at present, of assigning the true cause for every outbreak of Graves's disease is well illustrated by the history of an acute case, which ran its whole course while the patient was under observation in Van

Noorden's clinic, and apparently free from unfavorable influences.

Infectious diseases sometimes lead to thyroiditis, and thus to Graves's disease.

Uterine fibroids, disease of the nasal tract, and disease of the intestinal tract—the latter serving perhaps as a source of ptomaine poisoning—are occasionally partial causes which should be remembered during efforts at treatment.

Partial atony of the large intestine is a frequent and important complication, perhaps even a cause, of exophthalmic goitre. Federn (Wiener Klinik, Mar., Apr., '91).

Pathology.—The account of the pathological anatomy must be, for the present, confined to the description of the appearances observed in the different organs, and, as most of these are secondary, they can be dismissed briefly. Of great importance, however, are the changes noticed in the thyroid gland, and for these the results reached by Hämig may be accepted as expressing the best modern views. In common with the majority of observers, Hämig found a diffuse parenchymatous hyperplasia of special form. This hyperplasia may lead to the formation of nodules, and it may be attended by an alteration of the secretion such that thin albuminous secretion is formed instead of the colloid. The cylindrical cells of the gland may undergo vacuolization, which is to be taken as a result of activity of secretion.

Other forms of goitre occur in Graves's disease, but they arise from other causes, such, for example, as those which lead to the endemic variety, and the changes found in them are not characteristic of the exophthalmic form of goitre.

There are slight histological differences in different cases, such that sometimes the arrangement of the cells is diffuse, while in other cases small, ill-defined follicles are formed, and in others

the tissue takes on an embryonic character. Again, the epithelium may be of slender form and the arrangement glandular.

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Goitre examined in 10 cases of Graves's disease. Of these 8 were diffuse and 2 nodular. The diffuse were divisible into three groups. In the first the alveoli were large and filled with colloid material, and were distinguished from those of normal thyroids only by the presence of colloid in the lymph- and blood-vessels and between the fibres of the stroma. In the second group the follicles were smaller, and usually only partly filled with colloid, which was not so shining as in the first group. The septa contained less colloid in the connective tissue and lymphatics, but just as much in the veins. The epithelium showed a tendency to form papillæ. The thyroids of the third group contained many solid cell-masses, of which some were follicles filled with desquamated epithelium, others lobules and groups of lobules made up of narrow cell-strands. In the nodular goitre some lobules attained a diameter of $\frac{1}{2}$ to 3 centimetres; others were compressed to a diameter of $\frac{1}{10}$ millimetre. Many nodules were made up of solid cell-strands containing in numerous places balls of colloid matter. Other nodules consisted of small, solid cell-masses; still others resembled the ordinary colloid goitre. The first group of diffuse hyperplastic goitres showed hypersecretion; the second, an increase of function associated with an alteration in the secreted matter, allowing more ready absorption; while in the third group the increased activity of the gland manifested itself partly in hypersecretion, partly in the formation of solid cell-masses. Ferner (Virch. Arch., Mar., '96).

The lymph-glands throughout the body may be enlarged and the thymus persistent. A great number of special lesions have been found in one or another segment of the nervous system, especially the medulla oblongata, but

they are, in all probability, secondary and indicative of the excitation going on there.

The heart may be found dilated and its muscles degenerated; and so, also, degenerations in the arteries and in the internal organs have been found; and in the spinal cord.

The time has gone by when any considerable number of supporters can be found for the theory that this disease is due to the localized lesions occasionally found in the medulla oblongata or the sympathetic system.

Literature of '96-'97-'98.

Emphasis laid upon the presence of a permanent stimulation of that portion of the cervical sympathetic which presides over the dilatation of vessels in the orbit, in the thyroid body, and over the heart. The thyroid enlargement considered to be secondary effect of this distension; to be a symptom of the disease, and not the cause. That superabundance of thyroid secretion thus induced may be injurious is, however, admitted.

The lesion is nuclear, the nuclei of nerves influencing the heart and blood-vessels, as indicated, being discrete in the bulb and upper portion of the cord (while those influencing the limb and trunk-vessels are lower down and therefore escape), and are there affected singly or in groups. Abadie (*Arch. d'Opht.*, Nov., '96).

The key to the real mystery of the disease must be sought elsewhere, and it is generally agreed that the only plausible explanations of the great array of symptoms which are liable to present themselves are, on the one hand, that suggested by the name "neurosis," and, on the other hand, that which assumes a toxic action due to altered secretion of the thyroid gland. The "neurotic theory" is certainly a reasonable one. It is true that the term is vague, but the argu-

ment brought forward by Möbius, that one could not properly attribute the enlargement of the thyroid to a nervous disorder is certainly untenable. It has been proved experimentally that the most trifling mechanical injuries of the gland are enough to change the character of the secretion and induce parenchymatous hypertrophy, and it is far from unreasonable to suppose that the same result might follow an alteration of the secretion due to nervous influence. In favor of the "neurotic" theory is, of course, the strongly-marked clinical relationship of the disease and its mode of origin. On the other hand, there is also a great deal to say in favor of the view that the altered and increased secretions of the thyroid gland are important factors. The therapeutic and experimental study of thyroidization is in support of this view, and the striking contrast between myxœdema and Graves's disease, as regards the condition of the skin, the nervous system, and the like, even though it does not fully bear critical analysis, is, in general, in favor of this conception.

On the whole, it seems to me perfectly clear, on grounds that cannot be elaborated here at length, that we are still far from grasping the problem in its whole complexity. There is one aspect which has never been sufficiently dwelt upon, and that is the relation of the symptoms of Graves's disease and of myxœdema as well to quasiphysiological states. If in those two conditions we have indications of an excess, on the one hand, and a deficiency, on the other, of the thyroid secretion, then there must be a middle point corresponding to health, and, if alterations of the thyroid secretion in one direction causes abnormal mobility of the nervous system and in the other direction an abnormal sluggishness

(leaving out of consideration, for brevity's sake, the question as to the development of uncompensated tissue-poisons), then it is fair to assume that the ordinary mobility of the nervous system is, in a way, dependent on a normal amount and quantity of the thyroid secretion. However this may be, it seems more than probable that we have in Graves's disease a collection of symptoms which are united together not only as manifesting the action of the thyroid poison, but as having a certain quasiphysiological relationship to each other.

Prognosis.—Some cases of Graves's disease run a rapid course, ending in recovery, and this is especially true of outbreaks occurring in childhood. In a case under the observation of a colleague of the writer, a girl, 8 years old, had an acute attack due to fright from harsh treatment by her father, but was well at the end of a few weeks. Recovery is also possible in acute cases occurring in adult life and in mild chronic cases, though it is far more common to see some few symptoms persist in spite of substantial recovery from the rest. The exophthalmos often overlasts the other signs.

Some cases have a malignant aspect almost from the outset, and die very rapidly after a few weeks or even days, or from exhaustion and cachexia at the end of a few years. Even cases of great severity may, however, take a favorable turn and substantially recover under favorable conditions; so that no case ought really to be despaired of.

Case of rapidly-fatal exophthalmic goitre observed, the patient dying in three days after pronounced symptoms had appeared. Lloyd (Polyclinic, Apr., '88).

Prognosis is comparatively favorable, as far as life is concerned. Nothnagel (Med. Press and Circular, Nov. 27, '89).

Prognosis is more unfavorable in men

than in women. Kahler (Inter. klin. Rund., Mar. 10, '90).

Gradual subsidence of the cardinal symptoms in Graves's disease noted for long periods. In such cases complete recovery may be claimed. Pribram (Wiener klin. Rund., No. 44, '95).

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In 24 cases there was fatal termination in 6; recovery complete or almost complete in 7; improvement in 7; condition much the same in 3. R. T. Williamson (Brit. Med. Jour., Nov. 7, '96).

Treatment.—A great number of methods have been used for Graves's disease and have had their enthusiastic supporters, but it is the conviction of the writer, after a careful trial of them all, that the principal factor in bringing about the favorable result has been not so much that any one of them has struck at the real root of the disease, but that they have either induced an improvement in some one particular, or have inspired the patient with confidence and encouragement, and through one or both of these ways have given a new "set" to the disordered nerve-functions, which form the chief feature of the malady. In no other way can we explain why it is that one observer has insisted upon the importance of the treatment of the intestinal tract; another on the treatment of the sympathetic system, or the heart; another on that of the nervous system; another on that of thyroid; one on weak, another on strong, electrical currents, etc. If this generalization is correct, it follows that the conscientious physician should have two aims in view: first, to treat his patients with persistence and determined confidence, in order that they may catch his tone of encouragement; next, that each case should be energetically treated at the most assailable point, or points. The treatments proposed may be roughly divided into the "empirical,"

or "symptomatic," and the "rational," or those based on some theory of the disease. Of the former class the most important are the treatment of the heart, the nervous excitability, the digestive disorders, and the like. To the second class belong the electrical treatment of the sympathetic nerves, the surgical treatment of the thyroid gland, the use of specific remedies like thyroid and thymus extracts (see ANIMAL EXTRACTS: THYROID, THYMUS, and SPLENIC EXTRACTS), the adoption of special diets, used without regard to particular forms of indigestion. Any or all of these treatments may have their value, as above indicated, by encouraging the patient, but those which are really most effective in combating some one feature of the disease and thus helping to give an impulse toward recovery are, in the writer's opinion, the following: Absolute rest, provided this can be accomplished under favorable and effectual hygienic conditions agreeable to the patient; surgical treatment of the thyroid or sympathetic nerves.

Twenty-four operations performed for the extirpation of goitre, 15 being total and 9 partial; of the former, 5 proved fatal. In 10 cases no symptoms of cachexia strumipriva or myœdema have appeared in periods varying from one to four years. Bardeleben (*Deut. Zeit. f. Chir.*, B. 26, H. 1, 2, '88).

Unilateral extirpation performed in 5 cases, with improvement in all. One of the cases had a severe recurrence two years after the operation. Immediately after the operation there was observed a most striking retrogression of all symptoms of the disease. J. Wolff (*Deut. med. Woch.*, Mar. 16, '92).

Statistics of forty-one operations for exophthalmic goitre given, with only two deaths. Those cases classed as surgical in which the nervous symptoms seem directly dependent upon the size and growth of the goitre. Albert H. Freiberg (*Med. News*, lxiii, 225, '93).

Operative procedure advocated in cases of ophthalmic goitre, on the strength of writer's personal experience. In 1890 he operated on 2 severe cases, and both recovered almost completely. In 1891 he operated on 3, 1 of whom died shortly after of influenza, though considerably relieved of the original trouble. The second recovered entirely; the third passed from observation. He has since operated on 3 cases with similarly happy result. The improvements he points out may be at first somewhat rapid, but is afterward slow and does not reach the highest point until a year or two have elapsed. Lemke (*Deut. med. Woch.*, No. 42, '94).

Operative interference in Graves's disease is gaining ground every day, and no one at present doubts the efficacy of this treatment. Mikulicz (*Med. Week*, iii, 194, '95).

Operation of extirpation of goitre in Graves's disease is dangerous. Kocher (*Med. Week*, iii, 194, '95).

Ligature practiced in twenty-two cases of Graves's disease. All four arteries tied without any symptoms of cachexia. Rydygier (*Med. Week*, iii, 195, '95).

One hundred and thirty-eight cases in which operation was undertaken. Of these, 114 were improved, 17 cured, and 4 died. Abram (*Lancet*, Nov. 16, '95).

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One hundred and eighty-seven cases in which surgical operation was undertaken. Of these, 13 died as the result of the operation, 60 recovered, 47 improved, 11 were unimproved, and in 25 the result is unknown. Kinnicutt (*Med. Rec.*, Apr. 18, '96).

One hundred and ninety cases of exophthalmic goitre in which some form of operation was done. Of these, 74 are reported as completely cured, many of them having been watched two or four years before the result was published. Exophthalmos sometimes persisted for a year after operation; 45 of the cases were improved and 3 were not benefited; 23 cases died immediately after operation, and, as hæmorrhage was not the cause and careful aseptic precautions

were taken, the writer holds that the cause of death is a sudden poisoning of the system by excessive absorption of thyroid juice. This may be due to the manipulation of the thyroid gland or to the increased absorption of torn vessels or to the stimulation by the ether. Local anæsthesia by cocaine should be used instead of ether. Starr (*Med. News*, Apr. 18, '96).

Section of the sympathetic is neither dangerous nor difficult. It powerfully affects the triad of symptoms, and this effect is permanent, especially after exophthalmos. It can be practiced concurrently with other interventions, provided they have not diminished the exophthalmos. Gayet (*Lyon Méd.*, No. 30, '96).

Operating in exophthalmic goitre by bilateral complete removal of the sympathetic ganglia in the neck advocated. The operation itself is difficult of performance, and in some cases, owing to the fusion of the lower cervical with the upper dorsal ganglia, and to the close investiture of the trunk by important and intricate net-work of vessels, is impossible. While some surgeons, after division of the sympathetic trunk on one side, have observed no pupillary or similar changes, others have. The author has usually found myosis, increased salivary and lacrymal secretion, ptosis, and flushing of the face, but these symptoms were very transitory, and so slight that when the operation is bilateral, and when thus one has no standard with which to compare, they often are quite invisible. Resection of even the whole of the cervical sympathetic trunk on both sides does not necessarily produce any evil result; in exophthalmic goitre the operation is "absolutely indicated." Jannesco (*Ann. d'Ocul.*, Mar., '97).

Cervical sympathetic excised in three cases. It is a "good operation," but ether should be used instead of chloroform, and the two sides of the neck should be operated upon at different times. Faure (*Rev. de Chir.*, No. 11, Suppl., '97).

Nine cases of section of the cervical sympathetic for exophthalmic goitre re-

ported. The results were good, both with respect to the exophthalmos and to the goitre and palpitations. The best effect was obtained in young people in whom presumably the accelerator system of the heart was less developed and more thoroughly modified by the division of the sympathetic. In cases of failure of the treatment an explanation might be found in the existence of two sympathetic cords in the neck: a not infrequent anomaly. Jaboulay (*Progrès Méd.*, July 31, '97).

Section of the sympathetic pronounced as resultless and unnecessary, thyroidectomy as successful and safe, while the after-occurrence of myxœdema need not be feared, as, out of a large number operated on, only two or three developed this disease. Péan (*Bull. Acad. de Méd.*, Tome iii, p. 31, '97).

Two cases observed in which ablation of the thyroid gland cured all the symptoms of exophthalmic goitre. When the patients were given thyroid extract, after the apparent cure, all the symptoms returned temporarily. The removal of the gland is easy and devoid of danger, section of the sympathetic is useless and dangerous. Doyen (*Semaine Méd.*, July 29, '97).

If a portion of the thyroid gland be removed, the vesicles of the remainder enlarge, and become altered in shape from round or cubical to oblong or branched; the lining membrane becomes convoluted, the lining secreting cells columnar instead of cubical, and the colloid contents of the vesicles become less viscid and more watery. These changes appear to be identical with those found in the enlarged thyroid of Graves's disease; hence it may be inferred that the typical change in the enlarged thyroid in Graves's disease is of the nature of a compensating hypertrophy. Previous division of nerves has no effect upon these changes, and hence the enlarged thyroid of Graves's disease is not primarily of central origin. A number of experiments were performed upon dogs, with a view to further determining the function of the parathyroid glands. If a single parathyroid and a minute piece of thyroid proper were left, no symptoms

of any kind appeared, whereas death followed if the parathyroid were subsequently excised, although the small piece of the thyroid proper was left. The excision of the parathyroids would thus appear to be the cause of the acute symptoms (tremors, rigidity, convulsive attacks of dyspnœa, and death) which follow the total excision of the thyroids, and that the excision of thyroid proper causes only the symptoms of myxœdema. Edmunds (*Jour. Path. and Bact.*, Jan., '98).

The surgical treatment of the thyroid and removal of one or both cervical sympathetic ganglia seems unquestionably to be a treatment of great value, and to be applicable not only in the class of cases called "secondary," where an indolent goitre has been present for some years, but in the "primary" cases as well. The objection to it, as may be stated once for all, is the fact that a large proportion of the cases have ended fatally, for some unknown reason, so that it should not be adopted without an expressed willingness on the part of the patients and their friends to take a real risk.

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Any operative treatment of exophthalmic goitre is likely to be attended by serious and quite special risk. Lejars (*Bull. et Mem. de la Soc. de Chir. de Paris*, Mar., '97).

When we leave these two methods of treatment we come to quite a number which, in my opinion, owe their efficiency, as I have indicated, not to their specific effect, but to their general effect. The treatment of this class which I have found most valuable is persistent faradization or galvanization of the thyroid gland with strong currents. It is, perhaps, going too far to deny a beneficial local action to this sort of treatment of the gland. Certainly it is useful, whatever its mode of action. Through this

means a great proportion of the patients presenting themselves at the Massachusetts General Hospital have been treated with marked benefit.

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The avoidance of all excitement and emotional outbreaks and a careful regard for the general health must be insisted upon.

The systematic use of the galvanic current is the most important element of treatment. The current should be weak, from $\frac{1}{2}$ to $1\frac{1}{2}$ milliampères, applied for a short time (one to three minutes) every other day. The cathode is applied at the angle of the lower jaw, first on one side and then on the other, while the anode is applied at the back of the neck. After ten or fifteen treatments a steadily-progressing improvement is noted, which may last for years. The medicinal agents comprise the slowly-increasing use of strophanthus, beginning with 1 drop of the tincture twice daily and increasing to 10. It is especially indicated where the tachycardia is well-pronounced.

Codliver-oil is the best tonic.

The drinking of several pints of pure spring or distilled aerated water daily and a diet of nitrogenous foods mostly are important adjuncts of treatment. William C. Krauss (*Buffalo Med. Jour.*, May, '96).

Good results obtained from the use of the constant galvanic current in the treatment of Basedow's disease. The exophthalmos diminished or disappeared, the general condition improved, and there was diminution of the disordered cardiac innervation and in volume of the hypertrophied thyroid body. Bertram (*Arch. de Gynec., Obst., y Ped.*, No. 5, '98).

The other treatments which are occasionally useful are the thyroid preparations, the thymus preparations, and—it is said—the suprarenal extract, all of which should be given in as large doses as can be comfortably borne; cardiac tonics, especially strophanthus, mild diet,

and intestinal antiseptics. (See *ANIMAL EXTRACTS: THYROID, THYMUS, and SPLENIC EXTRACTS, Volume First.*)

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EXTERNAL EAR, Diseases of the.—

The external ear furnishes about one-fourth of all aural work, by reason of its diseases and anomalies; and, in consideration of the fact that much of our examination and treatment of the middle ear has to be through this channel, its careful study is requisite in otology. Statistical tables show that more than half of these are cases of impacted cerumen, and the bulk of the remainder fall under the convenient—if vague—headings of diffuse, or eczematous, and circumscribed, or furuncular, inflammations; but the rare affections have still enough of pathological interest to call for brief discussion.

Malformations.—Many of the malformations of the auricle have only embryological interest; but the rudimentary microtia is usually accompanied by stenosis or absence of the auditory canal, and the question of operative intervention comes up,—generally for a negative answer. Possibly a crumpled auricle can be straightened out by plastic operation, for more natural growth and a covered bony canal can be opened; yet too often exploration fails to find the canal, and even the tympanum may be undeveloped; so any opening of the bone is counter-indicated. Otherwise any reasonable plastic surgery may be attempted. The little congenital fistula seen at times above the tragus may suppurate and demand curetting or excision: and auricular appendages or reduplications of the auricle may call for removal.

Injuries.—Wounds, burns, and abscesses (see *FURUNCLE*, below) should

receive the usual surgical treatment, the last being rare except in the lobule, where generally due to septic piercing for ear-rings.

Piercing the lobule for ear-rings often leads to secondary infections. Lupus, tubercle, and syphilis are among the maladies thus communicated. Fournier (*Jour. des Mal. Cut. et Syph.*, vi, p. 321, '94).

Case of infection of the external ear from vaccine inoculation. The poison was conveyed from the arm of an infant by the nurse to her own auditory meatus. Recovery ensued in three weeks, leaving a characteristic scar in the lower wall of the auditory canal. Szenes (*Germ. Otol. Soc.; Arch. f. Ohrenh.*, Sept., '95).

Fracture of the external osseous canal and its integumentary tissues by force transmitted through the inferior maxilla is not infrequent, and its importance arises from the fact that it may be overlooked entirely, or else mistaken for a fracture of the base of the skull or for a ruptured membrana tympani. Barclay (*Med. Review*, May 12, '94).

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Purulent otitis, erysipelas, adenitis, impetigo, syphilis, lupus, and simple supuration which by extension may become severe and even threatening in its consequences, may all result from the piercing of children's ears without proper antiseptic precautions. Roeha (*Jour. de Clin. et Théor. Inf.*, Feb. 6, '96).

Case of gangrene of the ear in which the necrotic process involved both anterior and posterior surfaces of the concha. S. S. Bishop (*Jour. Amer. Med. Assoc.*, Mar. 28, '96).

In the majority of cases it is impossible to diagnose fracture of the auricle by simple visual examination; but manipulation with both hands—one grasping the pinna and the other the lobule—will elicit crepitus, and if transillumination is used the line of fracture can be readily made out, especially if inflammatory changes have not progressed to any great extent. Lewis S. Somers (*N. Y. Med. Jour.*, Jan. 22, '98).

Hæmatoma and perichondritis are often of traumatic origin, each marked by effusion between the perichondrium and cartilage with serious impairment of its vitality. Deformity is apt to follow; but early relief of tension and judicious use of massage are our best measures for cure of mitigation. Any inflammatory symptoms, such as usually differentiate these otherwise similar affections, are to be allayed before much stimulation is attempted.

Interesting case of hæmatoma of the ear seen in which the staphylococcus pyogenes aureus was found. J. Justin McCarthy (Maryland Med. Jour., vol. xxxvii, No. 3).

Importance emphasized of distinguishing between an ordinary cystic tumor and othæmatoma; that such tumors produce deformity is, most frequently, on account of the heroic measures resorted to for their removal. Lavrand (La Semaine Méd., May 7, '92).

Ossification of the auricle rare, and in the very few cases on record it has resulted from senile changes, but writer had case in which it developed in consequence of perichondritis sero-purulent. H. Knapp (Archives of Otol., Jan., '90).

Most cases of so-called primary perichondritis of the auricle are in reality instances of cutitis and lymphangitis of the outer ear. This leads to altered nutrition in the perichondrium and the cartilage. A. Courtade (Ann. des. Mal. de l'Oreille, Aug., '94).

Growths.—Cysts are generally back of the ear and more commonly congenital, however late the apparent beginning. They may be serous, sebaceous, or teratoid, and should be dissected out entire.

Cysts of the auricle treated by electrocautery applications. The cyst is opened by incision, its contents allowed to escape, and the sack washed with sublimate solution. The walls are then curetted, and an electrocautery point, made into the form of a small button of platinum, introduced into the sack and the walls seared. The interior is

then washed out with sublimate solution and a compress applied, covered with iodoform gauze. The parts heal quickly, and with slight or no deformity. Albespy (Revue de Laryn., d'Otol., et de Rhin., Dec. 15, '92).

Fibroma of the lobule is usually a keloid formation sequent upon piercing or the wearing of irritating rings; it is therefore commoner in the negro. It is not apt to attain great size and seems always benign; but thorough eradication is the only safeguard against prompt recurrence.

Great frequency of fibrous tumors of the lobe in negroes attributed to the



Fibrous tumors of the lobules. (Bullard.)

wearing of brass jewelry. Impaction of cerumen is of rare occurrence, not only on account of the large size of the meatus, but also because such collections are seldom found in plebeian ears. Turnbull ("Impaired Hearing," '87).

Two cases of lupus seen, the result of perforation of the lobules for ear-rings. Fournier (Jour. de Méd., July 15, '94).

Case of tumors of the auricle observed. The growths, shown in the accompanying illustration, were fibrous tumors of the lobules, resulting from an inflammatory process induced by piercing the lobules for ear-rings. Bullard (Virginia Med. Monthly, Sept., '95).

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Keloid occurs more frequently in the negro than in the white race, and is not due so much to the size or nature of the rings worn in the ear, but to the inherent tendency of this race to the formation of fibroid tumors. The tendency to recur is very great. Scheppegrell (*N. Y. Med. Jour.*, Oct. 17, '96).

Other neoplasms are too rare to need discussion.

Eczematous inflammation of the auricle is commonly due to its extension from the canal, where it has been set up by irritating discharges. Intertrigo back of the ear or isolated affection of the pinna or canal has often other causes; and in the absence of otorrhœa, gout, or struma, or other malnutrition, is apt to be its basis. It may be a severe affection, with pyrexia and almost phlegmonous swelling; and in such cases it is wiser to isolate, give full doses of tr. ferri chlor., and deal with it as erysipelatous. Locally there are generally abundant micro-organisms; and whether these are causative or not, we should, with all promptness, remove the conditions favorable to their growth. Moisture is to be avoided, as well as any oily materials which might decompose and irritate; and any weeping of the surface should be dried by vigorous use of silver nitrate. Bismuth, calomel, hydrag. oxidi flavi, or ichthyol in weak ointment should relieve the irritable conditions; oil of cade or more stimulating salves, the more chronic phases. As a prelude to any treatment, the affected surface should be cleaned as perfectly as possible of all crusts or desquamation, hydrogen dioxide being probably the best agent, since it also penetrates and disinfects, while bringing to view, as snowy patches, affected areas beneath the surface. The chosen ointment should then be rubbed in, gently, but persistently, until these deeper patches have

been again made invisible by its penetration. The prescribing of medication without supervising or personally carrying out the employment of it will generally prove ineffectual. The affection is often stubborn at best and prone to recur, and strict regimen and constitutional medication may be requisite to ward off attacks. Herpes may, in very rare cases, be mistaken for it; but the pain in herpes is apt to be severe before any eruption and the course of the affection is quite different.

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Herpes at the orifice of the external auditory canal cured by tonics and the local application of yellow oxide of mercury. L. S. Somers (*Am. Medico-Surg. Bull.*, Oct. 31, '96).

The itching of eczema is as trying in the canal as in any other location, and there is a strong temptation to scratch, abrade, and infect the surfaces. Furuncle is apt to follow, and autoinoculation may establish a series. As elsewhere, there are two sets of glands open to involvement: the superficial sebaceous hair-glands and the deeper coiled glands, here secreting cerumen instead of sweat. The latter may actually enter the perichondrium or periosteum; so their supuration may not only cause swelling of the whole aural region and displace the auricle in a way suggestive of mastoid abscess, but may really cause caries of the bony wall. Hence slight eczemas deserve treatment as a prophylaxis, even when no redness or desquamation marks their existence.

In eczema of the auricle and external auditory canal the use of a wash of Van Swieten's solution, diluted with three or four times its volume of water, recommended. The parts are then dried with absorbent gauze, and dusted, morning and evening, with iodol. This form of treatment is of service in case of "moist

eczema." For "dry eczema" after using the wash, as above, the parts are dried, and the following ointment is applied: Iodol, 15 grains; lanolin, 1 ounce. Chatterlier (*Annales des Mal. de l'Oreille*, etc., July, '93).

Induration is present in most chronic eczemas, and the resulting rigidity of the auricle and canal is often our only diagnostic sign. Something of this sort will generally be found in the other ear when one only is affected with furuncle. The right ear is more often affected in adults, probably as it is more often scratched.

Furuncle may be extremely painful and a series occurring in a patient out of health may positively endanger life through exhaustion. The first appearances should be vigorously treated, therefore, and the later stages sedulously cared for until resolution is complete.

Furuncles often appear after the removal of impactions of cerumen. For this reason a boric-acid wash should be applied before removing such masses:

R Acid. boric., 45 grains.

Glycerinæ et aq. destil., 1 1/2 ounces.

Twice daily, for one or two days before the final syringing for removal of the impaction, this solution is instilled into the affected ear. Loewenberg (*Jour. de Méd. de Bordeaux*, May 12, '89).

Staphylococcus pyogenes produces furuncles. They are forced into the follicles of the skin usually by mechanical irritation. Schimmelbusch (*Archiv für Ohrenh.*, '89).

Furuncles of the auditory canal are associated frequently with general furunculosis; in the majority of cases the *staphylococcus pyogenes aureus* is the offending micro-organism; next in frequency, the *albus* and *citreus*. Maggiora and Gradenigo (*Giornale della reale Accademia di Med.*, Torino, July, Aug., '91).

Gout is a frequent cause of furunculosis. When arising from this disease, the inflammation in the canal is relieved by the following treatment: The ear is to be washed with an alcoholic solution of

boric acid; it is then painted with a solution of bichloride of mercury,—1 to 2000; the parts are then to be covered with a preparation of the yellow oxide of mercury in vaselin. Internally, the patient is given liquor potassii, U. S. P., 10-drop doses in water; also, quiniæ muriatis, 2 grains until 8 grains have been taken, if there is very severe pain of neuralgic character. The diet is to be regulated strictly, so as to exclude all saccharin articles. Lawrence Turnbull (*Times and Register*, Oct. 3, '91).

The hearing is unlikely to be involved except temporarily; but the condition should not be too lightly regarded or the sufferer may seek a more sympathetic attendant. Leeching may greatly relieve the painful tension and abort or limit the lesion; heat, dry or by douche, is generally more convenient and as efficacious. The temperature should always be hotter than pleasant and the douche should be followed by drying, to avoid maceration. Poulticing is to be condemned, unless done for very brief intervals and only at the hottest bearable. Granulations about the mouth of an open furuncle are almost as certain evidence of abuse of poultices as is a "tea-leaf eye." Disinfection by mopping with hydrogen peroxide gives the benefit of massage, and should be followed by rubbing in of ung. hydrarg. ox. flav. This should not only be rubbed in as vigorously as can be borne, but should be inserted on a conical wad of cotton wedged in as firmly as can be tolerated. If the patient will bear this for the first few minutes, it generally reduces the congestion and brings relief; and it can even be pushed in more and more so as to maintain pressure. A persistent inunction and massage is thus obtained at every motion of the jaw; and a canal that was wholly closed one day with a furuncle that threatened days of suffering may be found open and well on toward resolution next day. In the

deeper form of the involvement such pressure cannot be endured. Heat will here have a limited value, and instillations of atropine, cocaine, morphine, carbolic acid, or a thousand vaunted remedies may avail as little. Morphine in full dose must be called in, therefore, to supplement the resolvent effect of heat by douche and hot-water bottle. Bags of salt retain heat well and can be used to good advantage, as can the Japanese hand-stove if its fumes are avoided. Incision of the swelled tissue, whether pus has formed or not, is in theory unimpeachable; in practice it can be generally avoided with moral and physical relief to the patient and an impression that the healing has been better without it. Diagnosis of the conditions beyond the swelling may be impossible, and tympanic involvement had better be assumed until it can be disproved; hence swellings in the bony canal, where glands are few and furuncle rare, should be earlier incised; and the possibility of underlying bone-disease never lost sight of as a cause rather than a consequence of the visible lesion.

Good results in the treatment of furuncles obtained from the use of solutions of menthol. Ten-per-cent. solution of menthol is sufficient to stop the development of staphylococci. For clinical use a solution of 20 per cent. recommended. A wad of cotton, moistened in this solution, is to be placed in the auditory canal so as to cover the diseased parts. These wads should be renewed once in twenty-four hours and the treatment continued until the affection is overcome. R. Cholewa (Ther. Monats., June, '89).

When the parts cannot be incised in furunculosis, the auditory canal is to be cleansed with an antiseptic wash. A small layer of cotton is then soaked in a 20-per-cent. solution of the subacetate of alum, and is placed as deeply in the canal as possible. This is covered with a layer of dry cotton, and one of rubber

outside so as to maintain the heat and moisture of the inner pledget. Grünwald (Münch. med. Woch., Mar. 3, '91).

Granulation-masses may be found in the canal, arising from its wall. Unless fringing the opening of a poulticed furuncle, these generally mark a sinus leading to or into the bone. There may be a burrowing out of tympanic pus along the periosteum by a track which a bristle could hardly follow; but generally a fine probe will find its way to bare and carious bone. A superficial lesion should be laid open and curetted, as cocaine will generally enable us to do with sufficient vigor. A deeper lesion will belong to the field of middle-ear surgery, not here treated.

Inspissated cerumen constitutes about one-seventh of the aural disorders. It is rarely a condition that can be regarded as merely an incidental retention of normal ear-wax, nor does the dirty occupation of even the coal-heavers who are affected with it more than partially explain its occurrence. There is generally more or less involvement of the middle-ear behind it; and the *decreased* amount and greater consistence of the excretion is often, as in the pharynx, the reason for the apparent increase of its amount. Wax is generally wholly lacking in suppurating ears, although brownish inspissated pus is easily mistaken for it; and in the chronic tympanic catarrhs it is generally a very good omen when wax begins again to form in the usually empty canal. Faulty configuration sometimes hinders its natural escape; but generally this is associated with an eczema which adds much exfoliated epidermis to the collection. The wax-glands are situated only in the outer two-thirds of the canal; so any wax found deeper is a foreign body, generally pushed there by meddlesome attempts at its removal.

The healthy ear needs no artificial

cleansing of its canal. Nature has provided that the epithelium of the centre of the drum-head shall grow faster than at any other point; hence it tends to overgrow its surroundings, as it were, and, pushing the older cells before it, to creep along the canal-wall. Superficial extravasations on the drum-head can thus be seen to migrate off its surface and a little way along the canal, before they are thrown off; and this outward growth carries all foreign material away from the tympanic membrane, where it might seriously impede function. Outside of the narrowed "isthmus" of the canal the wax-glands are present, and one of the functions of the wax is doubtless to agglutinate the flaky material. The motions imparted by the jaw to the lining of the canal is then probably all that is needful to convey these particles to the exit,—the spring of the hairs upon which they get caught serving to throw them at times out upon the shoulder.

When, through defect of this natural cleansing process or artificial interference with it, collections form within the canal, they are commonly at the middle third and may fill almost completely this tube; but so long as the smallest crevice remains through which the sound-waves can reach the tympanum there may be no symptom of their presence. Pressure may be noted or other irritation lead to interference, and then the mass may be pushed down upon the drum or made to occlude the meatus. More often the entrance of moisture swells the hydroscopic mass; and sudden and complete closure of the ear, with deafness, tinnitus, and autophony may alarm as well as distress the patient. Sudden deafness without pain or vertigo is apt to signify impacted cerumen.

History of a patient is given in whom tinnitus was so intense and took such

definite shape (threatening, or devilish voices, etc.) as to induce great mental depression—not, however, giving rise to systematized delusions. Twelve hours after the removal of masses of inspissated cerumen and pieces of tobacco from the ear, the "voices" disappeared entirely and were not noticed again. This case illustrates how certain abnormal mental states may be induced by the mere presence of foreign bodies in the auditory canal. Editorial (*Mass. Med. Jour.*, July, '91).

Literature of '96-'97-'98.

Occurrence of ear-cough, deafness, vertigo, and nausea from the presence of hard cerumen in the ear. In nervous persons a melancholic form of dysthymia may be produced by mechanical irritation in the external ear. R. W. Merrie (*Brit. Med. Jour.*, Oct. 10, '96).

The opposite ear is commonly in similar condition; so the habit of examining it first may save us from letting the same experience befall the patient there. A dark-brown or blackish, greasy mass can usually be seen at the first glance, even on drawing the canal straight and letting the light from a window fall into it past the examiner's head. Sometimes the hairs are enough to hide it and must be pressed aside with a speculum. This must here, as always, be used only under good illumination of the canal or it may serve to press the mass all the more distressingly. In all these examinations, as also in all manipulations in the canal, the normal configuration of the meatus must be borne in mind. It has an oval lumen with the longer diameter vertical at the exit but inclining forward as we go in. Its axis is spirally curved and tends usually upward and forward as we pass in, but the floor seems to sink a little as we approach the drum-head, constituting a slightly broadened, deepened sulcus, out of which foreign materials are rather hard to remove. The soft parts

constituting the outermost third of the canal exaggerate the curves and have to be drawn up (down, in the infant) and back and out in order to straighten it as much as possible, both for seeing in and for washing out anything there retained. The helix should therefore always be grasped between the index and middle fingers, so that this traction may be efficiently made, and yet the thumb and index-tip be left free to manipulate a speculum or otherwise serve us.

Wax plugs and all other foreign bodies should be washed out with the syringe. Only where this has been fully and skillfully used without avail has the most expert a right to employ other instruments; and then only with a gentle, steady hand and on a quiet or etherized patient. In almost all cases the syringe is the most efficient as well as the safest and gentlest means at our command; but it must be better used than commonly, if it is to justify this claim. A small, smoothly-working piston-syringe is to be preferred, with a small tip that can enter a little way into the canal without obstructing the view. The fluid employed should be hot water. It matters little or not at all whether this is medicated; soda, boric acid, or any harmless drug may be dissolved in it if the surgeon believes it better than pure water. The best solvent is really heat; and a temperature of 110° - 115° F. is generally well borne and less apt to cause dizziness than "luke-warm" water. A cup of some sort should be held beneath the lobule and the shoulder covered with a towel; then with the canal well illuminated by the forehead-mirror or other means and drawn straight as above described, we gently begin to inject the hot water. Perhaps along the upper back wall is the best direction for the stream; but this must be varied as sight of the mass sug-

gests. Beginning gently, the first few drachms serve to moisten the parts, the next to disintegrate the plug, discoloring the returning fluid with the dissolved wax; usually with my two-drachm instrument the eighth syringeful washes the mass out into the cup, with an expenditure of 2 ounces of water and five minutes, at most, of time.

But epidermis is not soluble in water or any other available material. When the impaction consists largely of laminated epithelium, especially if really a cholesteatoma-mass working out from the middle ear, no such easy task is to be anticipated. Prolonged syringing, aided, perhaps, by skillful use of the probe and forceps, must be employed to remove such a mass, and prudence may dictate adjourning the completion of the matter to a second sitting. The canal-walls are often excoriated beneath such a mass, and exfoliating, but not yet fully-detached, epidermis may anchor it to tender surfaces, from which it should not be violently torn away. But in true cerumen-impaction there is little or none of this. Delay in soaking or otherwise trifling with the plug only increases any irritation from its pressure. The patient, if put off, may never return to the surgeon whom he truly says made him worse instead of better. Dizziness or fainting may compel a suspension of the sitting; but if the patient has been warned to announce the first sensation of the sort, this can generally be forestalled; and an eye should generally be kept open for any clammy sweat on his brow. Pressure upon the tympanic structures is a common cause; and suction with the squeezed Politzer bag fitted in the canal will often undo the mischief and give instant relief. If not, the patient should be laid flat by tilting his chair back until the head is on or near the floor and induced

to lie still until feeling right again; when the chair can be raised again and we can proceed in a few moments without repetition of the disturbance.

After this and all other syringing, the canal should be gently dried with absorbent cotton on a delicate carrier and the air shut out by a light flake in the exit; otherwise there will be chilling from the evaporation of the trace of moisture left, with possibly unpleasant reaction. Any excoriated surfaces should be dusted with boric acid or aristol; and any needed treatment given to the nose, throat, and middle ear.

Literature of '96-'97-'98.

In the removal of cerumen instruments such as probes, hooks, etc., should be absolutely avoided.

The syringe should be thoroughly sterilized and capable of containing about three ounces and a quarter of liquid. The extremity should be very fine and perfectly cylindrical. It is well to attach a soft-rubber tube a centimetre long to the end, to prevent injury to the passage. Water that has been heated to 98° F. should be used, but it must not be applied too hot. In administering the injection, the end of the syringe should be directed along the upper wall of the meatus. The first injection should be made very gently, in order not to cause vertigo. If no symptoms occur, from 5 to 6 syringe-fuls may then be injected.

If the cerumen does not become loosened, violent syringing must not be resorted to. The cerumen must then be softened, and the following solution is recommended:—

R Sodium bicarbonate, 15 parts.

Glycerin.

Water, of each, 300 parts.

Six drops of this solution are to be warmed and dropped into the ear three times a day; a tampon of cotton is placed in the ear after each instillation.

At the end of forty-eight hours fresh injections may be repeated, and, if the lump is still immovable, the instillations are again resorted to.

After the extraction, the ear should be thoroughly dried and a small tampon of cotton placed in the entrance and allowed to remain there for two days. Laurens (*Presse Méd.*, Feb. 19, '96).

Foreign bodies in the ear are not common or important except as furnishing to incompetent and rash attendants opportunity for improper and sometimes most injurious interference. Let alone, none but gunshot missiles or living insects can often occasion the slightest damage, except as forming nuclei for subsequent collections of cerumen.

Literature of '96-'97-'98.

Case in which the point of a knife, apparently after a stab, was wedged in the posterior wall of the meatus twelve years before causing any reaction. The foreign body was removed by operation to recover from the ear affection. Ostmann (*Deut. med. Woch.*, No. 46, '96).

It is the injury inflicted in efforts to remove them that is responsible for numerous untoward results, occasionally fatal. Rarely will any such object be thrust primarily beyond the cartilaginous portion of the canal, whence its extraction by any competent method should be easy. It is only after family or friends or incompetent medical man has pressed it deeper and too often wounded or irritated to marked swelling the tissues about it, that the condition assumes any importance. Then the panic which assumes that it "will certainly go to the brain" must first be allayed; the patient quieted to bear examination, which previous abuse has taught him to dread; and the ground clearly taken that the intruding mass will be at once removed only if this can be safely done. To counsel delay *after* failure is apt to seem a reason for immediately seeking another and more vigorous attendant. Careful examination should first be made to determine the presence of the alleged for-

foreign body, and this should begin with the other ear, not only that the configuration of the parts may be noted, but because in the excitement one ear may be receiving attention belonging to both or to the other alone. If there is, in fact, a body to be removed, the syringe and water of about 105° F. should be used as above directed, and, unless there has been very bad mishandling, there is likely to be little difficulty in washing out the intruder.

Should there be firm impaction in the bony canal or such swelling of the soft parts as to defy this procedure, it is best to use the water hotter still to reduce the inflammation and then to wait until the conditions are more favorable. Urgent symptoms may forbid this delay; then if vigorous syringing is unavailing, other instruments, such as a fine loop of wire or a blunt hook, may be tried in skillful hands, usually under general anæsthesia, unless the patient is in perfect control. All but specially adapted forceps are commonly worse than useless and apt to force the body deeper. The agglutination-method may suit those who fear to use water lest it swell some bodies and cause seeds to germinate before they can be removed; but hours can rarely be spent over such matters. If the body really needs removal it is safer to lay the soft parts forward by a free incision behind the auricle, and in the shorter and wider naked canal to use efficient leverage or bold chiseling to free and extract the mass. The injury thus surgically inflicted should be healed in a week; what will be done in blindly groping in the depths of the ear may never be repaired, and the life as well as the hearing may be sacrificed by such "conservatism."

If after syringing vainly an impacted seed it is decided to wait for reduced inflammation, a few drops of carbolated

glycerin will serve as a sedative astringent and will dehydrate the seed as much as hours of syringing could swell it. So the science of those who syringe with substitutes for water is as wasted as that which floated up leaden shot with mercury instead of turning the ear down to let them fall out. Gravity can often be utilized in thus inclining the head, and gentle rotary rubbing in front of the ear will often coax out the foreign body. An air-douche with the Politzer bag or other means will sometimes best remove light substances, proving as efficacious as the old-fashioned, but reprehensible, "box on the ear" which has sent many a cherry-stone or pebble flying out across the room. The ear should be directed downward, drawn straight and relieved of any pressure of the jaw-condyle by opening the mouth.

Two cases of extensive destruction resulting from manipulations for the removal of foreign bodies from the ear. In the first instance the malleus had been completely detached; in the second the drum-heads and ossicles of both ears had been removed, and, during a period of "inflammatory reaction" which followed, the victim exhibited symptoms of meningitis. Driggs (*Occidental Med. Times*, Aug., '90).

For the removal of foreign bodies by detachment of the auricle, the writer believes that it should be resorted to: 1. Upon the appearance of symptoms dangerous to life. 2. When the body is of such consistency as to be absolutely impassable at the isthmus. 3. When the patient cannot remain under the constant observation of the surgeon. In all other cases, after trial by the simple measures for removal, it will be safe to wait for more favorable conditions, after swelling and intense inflammation have partially subsided. When foreign bodies are retained deeply imbedded in the canal, great stress is laid upon the importance of observing the patient's temperature and the condition of his eye-ground relative to the development

of beginning neuroretinitis. Operative measures must be resorted to before such condition has fully developed. Zanzal (*Wiener med. Presse*, Dec. 22, '89).

Foreign body forced into the drum-cavity from the external ear, followed by rough extraction, great irritation, tetanus, and death. Schmiegelow (*Archiv f. Orenh.*, B. 59, May, '95).

Case of fatal meningitis, in a child of 5 years, induced by rough endeavors to extract a bean from the external ear. Voss (*St. Petersburg med. Woch.*, June 10, '95).

Method which is simple and may be quite effective in cases where the body is not wedged too tightly in the canal or has been surrounded by a ring of swelled tissue. Some gutta-percha is melted in an iron spoon, and with a fine probe of iron wire, having a small ring at its extremity, some of the liquid gutta-percha is taken up and passed into the auditory canal; the gutter-percha is applied to the foreign body and held against it until the latter is firmly adherent. The probe is then withdrawn, bringing away the foreign body sticking fast to the gutta-percha head. Guillaume (*Union Méd. du Nord-est*, Dec., '93).

Literature of '96-'97-'98.

Case in which the writer was obliged to detach the auricle and chisel away the posterior and superior wall of the bony canal in order to remove a bean which had been forced into the drum-cavity of a child of 5. McBride (*Med. Chron.*, Feb., '96).

If a living insect has entered the ear, a few drops of sweet oil will smother it, and it may then be syringed out with warm water. If an inanimate substance has been placed in the ear, syringing with warm water will generally remove it if the ear has not been previously scratched by probes or forceps. If the latter has been done, the child should be etherized and the foreign body removed by an expert. There is no hurry demanded in such cases. The foreign substance had better be left in the ear indefinitely than to apply rough measures for its removal. Death has occurred by unskillful efforts to remove a foreign body from the ear of a child. Not the foreign bodies in the ear, but the im-

proper treatment, is the cause of death in such cases. Burnett (*"Amer. Year-book,"* p. 835, '96).

There is no reaction between the normal auditory canal and the foreign body placed in it; as such, the foreign substance is unattended with danger. Therefore, every hasty endeavor at removal is not only unnecessary, but may be injurious. 1. In all cases in which no rough endeavors at removal are made, syringing with warm water is sufficient to remove the foreign body. 2. The general physician should never employ anything but the syringe to remove foreign bodies from the ear. 3. An instrumental removal should never be attempted by anyone but a specialist skilled in the use of ear-specula and the technic necessary in such cases. Hummel (*Münch. med. Woch.*, Apr. 27, '97).

Otomycosis or the growth of aspergillus or other molds in the auditory canal is a rare affection, practically an eczematous inflammation with this infection as an accidental sequence and persisting irritant. Such organisms cannot flourish in a dry ear. It should be well cleansed and rigorously mopped with hydrogen dioxide, then dried with all thoroughness, and dusted with boric acid. Instillation of borated alcohol may precede this last, if it does not irritate too much. In the very rare instances when a few repetitions of this procedure fails of complete success, some of the many other commended drugs may be tried. As the growth may have penetrated deeply into the epithelium, no single treatment can be trusted to have destroyed every hypha and spore; and a non-mycotic eczema may remain to be cured. Exostosis and hyperostosis are generally self-limiting affections, very rarely in America calling for operation, and other new growths are too infrequent to call for special discussion.

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F

FACE PRESENTATIONS. See PAR-TURITION.

FALLOPIAN TUBE, DISEASES OF.
See OVARIES AND ANNEXES.

FARCY. See GLANDERS.

FATTY HEART AND OBESITY.

Definition.—The term “fatty heart” embraces two pathological distinct affections: (1) *fatty infiltration*, in which there is an abnormal accumulation of fat about the surface of the organ and in the interstitial tissue, and (2) *fatty degeneration*, by which is meant the transformation of the cardiac muscle-fibres into fat. Both conditions are frequently concomitant to general obesity.

Fatty Cardiac Infiltration and Obesity.

Symptoms.—A well-marked degree of fatty overgrowth may be unaccompanied by any symptoms, although the bodily vigor may be impaired. These cases are usually combined with general obesity. The muscle-fibre is weakened (not degenerated, as a rule), and as a consequence dilatation of the organ tends to supervene; this excites dyspnoea upon exertion. Under these circumstances, if extra labor is suddenly thrown upon the organ, from any cause whatsoever, the clinical indications of a weak heart (urgent dyspnoea, præcordial discomfort, palpitation, vertigo, syncope, cyanosis) promptly appear and become pronounced, followed later on by recurrences on every provocation.

In cardiac arrhythmia, so frequently observed in the obese, the apprehension of grave disease of the circulatory and respiratory apparatus usually entertained is not warranted. Slight intermittence after a series of regular beats, followed by a pause, is observed in youthful pa-

tients with slight heart-trouble, especially in young girls who exhibit the anæmic form of lipomatosis. Actual irregularity, in which regular beats and pulse-pauses alternate, is seen chiefly in fat people who have already passed their fiftieth year, and in whom other symptoms of heart-trouble are present. Complete irregularity, in which pulse-waves alternating in tension and size regularly follow one another, is seen in cases of obesity with marked heart-weakness, in which there is dyspnoea, angina pectoris, œdema, and dropsy. Simple cardiac intermittency and slight irregularity are not unfavorable as regards prognosis, and these cases may, after a course of treatment directed to adiposity, recover their pulse-regularity. The occurrence, however, of complete irregularity, *delirium cordis*, regarded as a sign of grave disturbance of the heart-mechanism which can never be completely removed, and sometimes also premonitory of sudden death. Kisch (Berliner klin. Woch., Mar. 18, '95).

Distressing attacks of asthma may develop after a full meal, or in the absence of any apparent exciting cause. A passive form of bronchitis, probably secondary to a weak heart, attended with the customary symptoms—cough and a slightly-colored expectoration—often arises.

Inspection shows a feeble, diffuse apex-beat, though in marked obesity I have frequently found it absent. Palpation serves to confirm the existence of a feeble impulse. The radial pulse is variable, though, as a rule, regular and moderately tense. Percussion yields dullness over an increased area, although this is not demonstrable in excessive obesity. Auscultation renders audible the feeble heart-sound in marked cases, and, with increasing dilatation, a systolic murmur. In moderate grades the heart-sounds may be clear.

Differential Diagnosis.—The diagnosis rests upon the combined presence of marked obesity and a weak heart. Although there is little danger of confounding fatty overgrowth with other cardiac affections, the fact is to be kept in remembrance that its persistence favors the occurrence of fatty degeneration, and it is not always possible to discern the sequence, since, as will appear hereafter, fatty degeneration may exist without engendering symptoms.

Although there are no certain signs of fatty heart, there are several symptoms, such as the general state of the patient, the condition of the heart-sounds, the cardiac rhythm, etc., which make the diagnosis very probable. Often this fatty deposit in and about the heart cannot be distinguished from fatty degeneration. Schott (*Brit. Med. Jour.*, Aug. 18, '94).

Certain points of distinction will be found in the division on fatty degeneration (*vide infra*).

Etiology.—The chief etiological factor is general corpulency. Among conditions *predisposing* to fat-production may be mentioned: (a) Heredity: in about 50 per cent. of the cases of obesity the tendency is inherited, and in these the abnormal accumulation of fat shows itself quite early in life. (b) Climate: corpulence occurs with relatively-increased frequency among the inhabitants of hot, moist countries, and of low countries of the temperate and arctic regions. (c) Habit and occupation: the sedentary habits of the rest-loving, phlegmatic temperament predisposes to fat-increase, while all sedentary occupations act in a similar manner. (d) Race: Jews are particularly subject to obesity, and the same may be said of races inhabiting certain hot, moist climates (*vide supra*); e.g., southern Italians, South-Pacific Islanders, and certain African peoples. (e) Age

and sex: acquired obesity most frequently arises in persons of advanced middle life, between 40 and 50 years, while the congenital form is seen in infancy and childhood. The fat-heart is never found in infancy (Cutler). Corpulency is more frequent among women (particularly Jewesses) than among men, and in the former sex it often appears at puberty and between the thirtieth and fortieth years. (f) Certain diseases and conditions may predispose (anæmia, paraplegia, and loss of blood and other fluids).

Literature of '96-'97-'98.

It is not absolutely necessary that tuberculosis in man be associated with loss of flesh. Virulent tubercle bacilli cannot only live for years in apparent robust health, but they may in addition very much increase their adipose tissue. Queyrat (*Gaz. des Hôp.*, No. 87, '97).

Apart from idiosyncrasy, deficient lung-capacity is, perhaps, the most frequent cause of overfatness. Editorial (*The Dietetic and Hygienic Gazette*, Jan., '98).

(g) Congenital anomalies and monstrosities (idiots, cretins, acephali).

The exciting causes may be tabulated as follows: 1. Inebriety; the intemperate use of alcoholic beverages, especially in the form of beer, ale, porter, and the like. 2. Ingestion of fat-making food in excess. Excessive use of fats, starches, and sugars, although the too free indulgence in proteids may also be responsible, especially with insufficient physical exercise. 3. The prolonged use of arsenic may sometimes lead to corpulence.

Pathology.—The characteristic change consists in an abnormal deposit of fat, more especially in places where this tissue-element is normally found, as the aurico-ventricular grooves, near to the apex, and about the great vessels at the base. This overproduction of fat is pres-

ent in every obese person, and when excessive may form an enveloping mantle, first covering the right ventricle, later the left also, attaining a diameter of an inch or more. The surface of the fat-heart generally presents a pale-yellow hue, but may be a deep-yellow color, resembling sulphur. The intermuscular fibrous tissue, as may be seen on section, is the seat also of increased accumulation of fat. In extreme cases the muscular fibres undergo atrophy, thus becoming weakened, from inordinate pressure.

The pathology of the fatty heart of obesity is primarily a fatty deposit on the heart and within its substance between the fibers. The inevitable pressure which such deposit makes may result in the development of a true fatty degeneration. Forchheimer (*Amer. Jour. Med. Sci.*, Oct., '88).

Dilatation often supervenes, and it is quite probable that the symptoms, when present, are dependent upon, and date from the time of, its occurrence. Rupture of the organ is also not unlikely. A coronary artery and the aortic arch are often arteriosclerotic. In the cachexias of carcinoma and phthisis, the general atrophy of the aged, fatty infiltration and fatty degeneration co-exist.

Twenty-one cases of fibroid degeneration met with in the post-mortem of the Glasgow Royal Infirmary since 1889. In 7 of the cases fatty metamorphosis was recorded as being present alongside of the fibroid degeneration. Distinguishing between fatty degeneration and fatty infiltration, it was found that the former was present alone in 2 cases, the latter alone in 4 cases, and that the two conditions were combined in 1. J. L. Stevens (*Jour. of Path. and Bact.*, vol. ii, p. 202, '93-'94).

Prognosis.—Cases in which fatty degeneration has not as yet been set up afford a favorable prognosis, especially if the cause be removable. On the other hand, in long-standing cases of excessive

obesity, more or less fatty change of the muscle-fibre may be safely inferred to exist, and the outlook is dubious, though much will depend upon the special cause and its degree of removability, as well as the presence or absence of serious complications. Among the latter, the more important are arteriosclerosis, albuminuria, glycosuria, anginal attacks, pulmonary congestion, cedema, and the like. Permanent results are not always attainable in cases dependent upon the patients' habits, since the latter are liable to relapse into them after a variable degree of improvement.

Treatment.—**PROPHYLAXIS.**—Although such cases generally first come under observation too late to receive the benefits of prophylactic measures, there are, nevertheless, many favorable opportunities presented to the wise family physician to attend to this important matter, even in the earlier years of those showing an hereditary predisposition to obesity. The fat-forming foods, particularly the carbohydrates, must be greatly restricted in the dietary. The amount of drink must also be diminished, as a rule. Fats and proteids are allowable, and their proportions must be regulated according to the amount of muscular activity. Systematic exercise, in the fresh, open air, along with cool baths, are measures to be adopted. Persons in middle life who manifest a predisposition to corpulency should be cautioned against all imprudences in eating and drinking; they should pursue a prescribed dietary, in which not only the character, but the quantities of the various substances allowed should be noted. If there be the slightest tendency toward anæmia, an open-air existence, short of injurious exposure, is imperative. Gymnastics and out-door sports, if wisely regulated, should play a part in the prophylactic

management of these cases. If anæmia be associated with fatty overgrowth, then greater care and caution must be exercised in recommending physical exercise, the amount of liquid may be much diminished, and the fat-forming dishes should be rigidly excluded. I have long been in the habit of prescribing arsenic, strychnine, and iron, in small doses, in such cases.

In the treatment of fatty overgrowth, the system introduced by Oertel, as I have observed personally, promises excellent results if faithfully employed. Among contra-indications that should be heeded are marked atheroma and chronic valvular disease of the heart, particularly in cases that have passed into the stage of broken compensation. The method will be briefly described, and comprises three parts: 1. The reduction of the amount of liquid taken with the meals and during the intervals, the total for each day being 36 ounces (1064.0). Additionally, frequent bathing, and in suitable cases the Turkish bath and pilocarpine are employed to induce free diaphoresis. 2. The diet is composed largely of proteids, as follows:—

Morning.—A cup of coffee or tea, with a little milk—about 6 ounces (178.0) altogether; bread, 3 ounces (93.0).

Noon.—Three to 4 ounces (90.0 to 120.0) of soup; 7 to 8 ounces (218.0 to 248.0) of roast beef, veal, game, or poultry, salad or a light vegetable, a little fish; 1 ounce (32.0) of bread or farinaceous pudding; 3 to 6 ounces (93.0 to 186.0) of fruit for dessert. No liquids at this meal, as a rule, but in hot weather 6 ounces (178.0) of light wine may be taken.

Afternoon.—Six ounces (178.0) of coffee or tea, with as much water. An ounce of bread as an indulgence.

Evening.—One or two soft-boiled eggs,

1 ounce (32.0) of bread, perhaps a small slice of cheese, salad, and fruit; 6 to 8 ounces (178.0 to 236.0) of wine, with 4 or 5 ounces (120.0 to 148.0) of water (Yeo).

3. Graduated exercise up slight elevations and inclines, the distance to be undertaken each day being carefully specified, beginning with slight efforts and frequently, though gradually, increasing them. A similar plan is to be pursued with reference to the degree of inclination, and it is to be recollected that this is the most important part of the Oertel system, since it directly and methodically invigorates the heart-muscles.

The all-important element of the treatment of obesity is that which has reference to overcoming the causal obesity. Here the *diet* should receive first consideration. From this the stimulation of the bodily forces that oxidize and destroy the fat cannot be disassociated. These two measures in combination, if properly employed in individual cases, will serve to bring about a diminution in the body-bulk, and tend to invigorate rather than weaken the patient. They may be briefly discussed in sequence for the sake of convenience.

(a) THE DIETETIC TREATMENT.—The ingestion of substances that are fat-forming must be restricted. The principal systems of dietary are those known by the names of Banting, Ebstein, and Oertel. In all of them the total amount of food is greatly diminished as long as there is an increase in the body-weight or a persistence of the sensations of discomfort.

In “Bantingism” sugars, fats, and starches are greatly reduced in the diet-list; water, however, is not restricted, and vinous and spirituous liquors are rather freely permitted. In those of a lithæmic, rheumatic, or gouty diathesis

(often associated with obesity) Banting's heavy proteid and alcohol dietary is not to be recommended. It is best, I think, to exclude alcohol in most cases, owing to its effect in diminishing tissue-oxidation and in retarding cell-metabolism.

In Ebstein's diet-list more than double the amount of fat and carbohydrates is permitted as compared with Banting's list, while the albuminous substances are diminished. Fat is freely allowed, while sugar and potatoes only are strictly forbidden. Oertel also allows more fat than Banting, but less fat and more (about double the quantity) proteids and carbohydrates than Ebstein. In addition to the 1 pint of water allowed in food, he permits 1 pint of free water daily. Oertel's special diet-list in fatty infiltration, as given above, is based upon these facts.

As an illustration, the following dietary may be ordered in selected cases:—

Morning Meal.—Fine wheat-bread, $1\frac{1}{4}$ ounces (40.0); a soft-boiled egg; milk, 1 ounce (32.0); sugar, 77 grains (4.9); coffee, $4\frac{1}{4}$ ounces (136.0).

Noon Meal.—Soup, 3 ounces (96.0); fish, 3 ounces (96.0); roast or boiled beef, veal, game, or poultry, 6 to 8 ounces (192.0 to 256.0); green vegetables, $1\frac{1}{2}$ ounces (48.0); bread, 1 ounce (32.0); fruit, 3 or 4 ounces (96.0 to 128.0); no liquid (or only 4 or 5 ounces—120.0 to 148 cubic centimetres—of very light wine).

Afternoon Meal.—Sugar, 77 grains (4.9); coffee, 4 ounces (128.0); milk, 1 ounce (32.0); occasionally bread, 1 ounce (32.0).

Evening Meal.—Caviare, $\frac{1}{3}$ ounce (10.6); one or two soft-boiled eggs; beef-steak, fowl, or game, 5 ounces (160.0); salad, 1 ounce (32.0); cheese, 1 drachm (4.0); bread, rye or bran, $\frac{1}{2}$ ounce (16.0); fruit or water, 4 to 5 ounces (120.0 to 148.0).

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For the treatment of obesity, diet: five meals during the day. For breakfast, a raw egg at 8 o'clock, $\frac{2}{3}$ ounce of lean meat or lean fish, the whole eaten cold and dry—this condition is emphasized, that the patient must eat his meat cold; cold meat may be consumed in greater quantity than hot meat without causing increase of weight; $\frac{1}{3}$ ounce of bread; 1 cup of hot tea without sugar. At 10 o'clock, 2 raw eggs, $\frac{1}{6}$ ounce of bread, 5 ounces of wine and water, or tea without sugar allowed. At noon, cold lean meat *ad libitum*, but no bread; a little water-cress or salad salted and flavored with lemon-juice; of raw fruits 3 to 5 ounces for dessert, and for drink, may be taken, with this meal, 1 or 2 tumblerfuls of water, or water simply reddened with a little wine. One-fourth hour after dinner a cup of weak tea not sweetened and at 4 P.M. a cup of weak tea not sweetened, and nothing else allowed. At 7 P.M. the same repast may be taken as in the morning at 8 o'clock, and a little more lean fish or meat may be added, which the patient may eat warm; the whole quantity must not exceed $3\frac{1}{3}$ ounces.

Exercise in the open air is insisted on; this may consist of a walk of half or three-fourths of an hour after each meal; that is, five times a day. The time spent in this exercise should be gradually increased from half an hour to three-fourths of an hour of brisk walking after each meal, and all the influence of the physician should be exerted to enforce this regulation. If the patient be a woman, a carriage-ride, with a walk in the country, may be the utmost that can be exacted.

Hydrotherapy followed by frictions, in a word, everything which stimulates the functions of the skin—vapor-baths, massage, etc.—may be enjoined.

Sleep during the day-time should be absolutely interdicted. The patient should go to bed at 11 o'clock P.M. and rise at 6 A.M. during the summer, and at 7 A.M. during the winter—not more than seven hours of sleep for the adult and eight hours for the child.

It is possible to obtain sufficiently

good effects from regimen without having recourse to any kind of medicine. A. Robin (*Bull. Gén. de Thér.*, Oct. 30, '97).

In the plethoric form of obesity increase of the albuminoid substances advised, besides lessening of the quantity of articles that increase the adipose tissue. Little restriction in the use of liquids. The anæmic form requires, on the contrary, a restriction of the liquids. In the aged, in whom the obesity has a tendency to decrease, the hydremic form must be opposed by the ingestion of an abundance of albuminoid material, of fat-producing substance, and the hydrocarbons. The increase of articles belonging to the latter class and the diminution of liquids prevent the too rapid destruction of fat. Oertel (*Wiener med. Woch.*: *Med. and Surg. Reporter*, Apr. 16, '98).

Too rigidly uniform measures in the treatment of obesity deprecated. Principal indications discussed under seven heads: 1. All dietetic excess should be avoided; three, or at the outside four, meals a day should be permitted and no food allowed in the intervals. The quantity and variety taken should be based upon the heat-giving properties of the food-substance. 2. The first essential is an adequate supply of proteids; a moderate amount of carbohydrate may be allowed, but the fat must be reduced to a minimum. Piquant seasonings are to be avoided. 3. The consumption of fluid is not to be limited unless symptoms of cardiac failure are present; such liquids as are fancied, with the exception of alcohols, may be taken at any time, but moderation is to be observed at meals. Cold water, especially if charged with carbonic acid, is to be preferred. 4. Exercise and active movements in the treatment of plethoric obesity insisted upon, the state of the heart being always taken into consideration; they are of particular value in increasing the activity of oxidation processes. In anæmic subjects, however, these advantages are counterbalanced by the increased nitrogenous waste, which may injuriously affect the heart. In these patients passive movements and massage are accordingly

to be recommended. 5. Great importance is attributed to diminution in the hours of sleep; sleep should be entirely forbidden during the day. 6. Tissue-change is also to be increased by baths, particularly in springs rich in carbon dioxide. Turkish baths are also of value if the heart is sound. 7. Important to secure pure air, rich in ozone, especially in a high and wooded neighborhood. Kisch (*Wiener med. Presse*, Mar. 13, '98).

Apenta water succeeds in producing a reduction of fat in the body without detriment to the existing albumin; that the general health of the patient suffers in no wise, and the cure runs its course in a satisfactory manner. Gerhard (Berliner klin. Woch.; *Med. Brief*, Feb., '98).

An effectual method of reducing obesity consists in drinking a large glass of the artificial Kissingen water, twenty to thirty minutes after each of the three daily meals, one day, and a similar glass of artificial Vichy water after each of the three daily meals the next day, and persistently continuing to take them thus, week after week; the patient will begin and gradually lose fat, until he comes down to medium weight and stoutness.

While using them, the person should, as a necessary guide, keep tally on his girth and weight; by taking his measures, and by carefully weighing his body in the same clothes, and on the same accurate scales, every two or three weeks, and if he has lost more than a couple of pounds for each week he should take a smaller glass of each, at every drink, and if he has lost less than a couple of pounds for each week he should squeeze a few teaspoonfuls of lemon-juice into each glass of the Kissingen and also add 1 teaspoonful of the aromatic spirit of ammonia to each glass of the Vichy.

He should also lend assistance to the action of the waters by using starches, sugars, fats, alcohols, and all other fat-forming foods but sparingly; should avoid overeating, and use neither food nor alcohols except at the regular meals: also take light suppers. He should also take moderate out-door exercise, on foot or wheel, or in any other

way that will increase and deepen his respiration, and promote tissue oxidation. William T. Cathell (Maryland Med. Jour., June 19, '97).

(b) The physical exercise (mechanical treatment) already mentioned is to be combined with the dietetic treatment.

Methodical exercises and baths may be carried out with benefit and without the risk attending other methods. When the heart has gained strength, efforts may be made to diminish the weight. Any rise of temperature is a contra-indication. The reducing treatment should be adopted cautiously and only in young subjects; too-rapid loss of weight must be avoided; general diseases and senile manifestations are, at least at first, a contra-indication to the reducing treatment; the fatty heart may often be treated successfully without loss of weight. Schott (Brit. Med. Jour., Aug. 18, '94).

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Exercise should be the physician's greatest reliance in the prevention or removal of obesity, and no form of this remedy can accomplish so much in this direction as judicious lung-exercise. Other forms of exercise must not be neglected. Editorial (The Dietetic and Hygienic Gazette, Jan., '98).

If increase of muscular activity is pushed to a degree, the temperature of the body is raised, anæmia results, and there is a reduced capability of exertion. This may be avoided by artificially cooling the body before the muscles are called into play. If a patient is treated for several days with cold sponge-baths, followed by steam-baths, the skin is soon brought into such a condition that this increase of temperature is avoided. Profuse excretion of sweat also assists in reducing the fat. After the steam-bath the patient takes a bath in a tub, and then the prescribed walk. Later, massage is utilized. This series of manipulations may be repeated twice, or, in some cases, three times daily. After the steam-bath some patients are at once put into a cold tub-bath. By this treatment within a few weeks can be brought

about a loss in weight of forty-five pounds without weakening the patient and without altering the diet to any great extent. Winternitz (Med. News, Jan. 29, '98).

It is especially in cases in which the subjective distress (dyspnœa, palpitation) is dependent upon cardiac dilatation due to fatty overgrowth that Oertel's system of graduated walking or climbing along "health-paths" is to be energetically recommended. The mechanical treatment is to be advised with extreme caution in cases presenting atheromatous vessels.

[In the latter class I have found the Checkley system of exercises free from injurious effects. These are also adapted to many cases of obesity if proper choice of the different exercises are made in accordance with the effects desired. J. M. ANDERS.]

The well-known Nauheim or Schott treatment may sometimes be employed: but it is not to be thought of if there be present any of the more characteristic evidences of fatty degeneration of the heart. The medicinal treatment of obesity is far from satisfactory.

The use of thyroid extract is coming into favor with the majority of the profession, while being condemned by a minority. If judiciously employed, it offers good results in many cases. Leichtenstern, Wendelstadt, Ewald, and others have reported success in a number of instances, especially in those exhibiting the anæmic, flabby, "myxœdematoid" variety of polysarcia. The loss of weight was two to three pounds in one week, and as high as twenty pounds in two to four weeks. In a number of my own cases belonging to this type of obesity the use of thyroid extract (desiccated) in small doses caused a progressive loss of weight ranging from two to six pounds per week, respectively,

without impairment of the general health. The effect of this agent upon the circulation, particularly the cardiac action, must be carefully noted, and in some instances it is necessary to protect the organ against its disturbing influence by the use of stimulants and tonics (strychnine, digitalis).

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Thyroid extract constitutes a means of rapidly reducing weight without causing any special disturbance in the patient's general condition or any limitation of his activities. The extract should be given in doses of 3 grains two or three times a day after meals, and gradually increased to 7½ grains. This treatment is continued for months, with occasional intermissions. The benefit proves most lasting in cases in which decrease in weight is slow. M. Affanasieff (Klinisch-therapeut. Woch., Feb. 6, '98).

Patient ordered thyroid extract for obesity. Within five weeks he took nearly 1000 tablets, each containing 5 grains. For the first three weeks nothing was noticed, except loss of flesh, but after this time dyspnoea came on, with swelling of the neck and very rapid loss of weight. Altogether, thirty pounds were lost, and five-sixths of this loss took place in the last three weeks. When examined, the patient had marked exophthalmos, with both Stellwag's and von Graefe's signs; the thyroid gland was enlarged and pulsated, and there was a thrill over it; there was a fine tremor of the fingers and tongue; the cardiac apex-beat was displaced outward, and the pulse was 120 to the minute; there was cough and severe mental depression; polyuria and glycosuria also were present. Under the use of Fowler's solution and after the withdrawal of the thyroid extract most of the symptoms rapidly disappeared, only the ocular manifestations and the goitre persisting for nearly six months. A. F. von Notthafft (Centralb. f. innere Med., Apr. 16, '98).

[The administration of thyroid extract should be attended by especial care, par-

ticularly at first. The chief editor has witnessed cases in which two grains three times a day caused vertigo and fainting-spells.]

Thyroidin, the active principle of the thyroid gland, gives results that are, perhaps, as good as thyroid feeding (Baumann and Ross).

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Patient successfully treated with thyroidin for a fatty heart. When gland of the ox was tried, patient began to make flesh rapidly. This sustains the opinion that the thymus and thyroid glands of the sheep are the most active. Schlesinger (Med. Press and Circular, Mar. 25, '96).

[Jeozykowski treated ten cases of corpulence by thyroidin in doses of from 5 to 8 grains *per diem*. In one case more than forty pounds were lost in two months, and in another thirty pounds in three months. J. M. ANDERS.]

The symptoms of thyroidism (tachycardia, vomiting, renal pain, suffusion of the face, syncope, vertigo, and marked headache) are a signal for a discontinuance of the remedy. The treatment may be resumed again, cautiously, alternating with intervals of cessation. (See ANIMAL EXTRACTS, volume i.)

Fatty Degeneration of the Heart.

Symptoms.—The condition may exist in an advanced form without the production of symptoms (latent fat-heart). The presence of any causal conditions, however, should be noted, and they afford premises for suspicions, although even when symptoms during life point strongly to the existence of fatty heart it may not be revealed by an autopsy. The characteristic evidence of defective heart-power are generally present, but in pernicious anæmia, chlorosis, and in certain wasting affections, the fatty change may be marked and the pulse continuing full and regular while the pa-

tient is at rest. In such cases, slight provocation or strong excitement lead to palpitation, leaving signs of commencing dilatation (an apical systolic murmur, with feeble, diffuse impulse). The condition is quite commonly associated with hypertrophy and chronic nephritis; it then gives rise to the phenomena that characterize failing compensation. The process is constantly associated with sclerosis of the coronaries, a clinical type which embraces most of the cases of so-called idiopathic fatty heart of the English writers. I have frequently observed that these cases manifest the same grouping of symptoms as met with in premature senility.

Dilatation is apt to supervene early in fatty degeneration of the heart, owing to the weakened state of the cardiac walls; hence it is quite probable that many of the symptoms that have been ascribed to the morbid processes are, in reality, due to secondary dilatation. It is to be remembered that the symptoms pointing clearly to defective heart-power may be in evidence only after great exertion. Among the symptoms pointing to over-distension, either constant or temporary, of the cardiac chambers, are palpitation, dyspnoea, and a small, irregular, somewhat quickened pulse, and cool and clammy extremities. Great physical exertion may produce sudden, marked dilatation, whereupon a canter-rhythm and an apical systolic murmur speedily develop, although in most instances the symptoms are brought to light in a more gradual manner.

Breathlessness on exertion, even though slight, and syncopal attacks are sometimes troublesome. There may be frequent attacks of cardiac asthma in the morning, and these may be accompanied at intervals with pains, anginoid in character and assuming the severity of pec-

toris even. The latter complication may, however, occur independently of the asthmatic seizures. The pulse, in consequence of the irritation of the inhibitory centre in the medulla, frequently becomes much retarded, declining from the normal rate to thirty or forty beats per minute, and in rare cases from ten to twelve beats. Disturbances of the intellect, at times assuming the form of maniacal delusions, may come on and persist for weeks and even months. The fatty arcus senilis possesses no diagnostic value. Two symptoms of considerable value, particularly when combined in the same case, are pseudo-apoplectic attacks, due to disturbance of the cerebral circulation, and Cheyne-Stokes respiration, the latter being among the later manifestations. When Cheyne-Stokes breathing is in association with pseudo-apoplectic seizures, they are more apt to be due to a uræmic toxæmia perhaps than to fatty degeneration of the heart. According to Broadbent, a noteworthy point is that well-marked dropsy is rare, and probably never occurs in uncomplicated degeneration. The significance of this is that the special effect of the disease is defective pressure in the venous system, and it is to this that the syncopal, apoplectic, and epileptiform attacks are due, which, together with angina pectoris, are the most characteristic later effects of fatty degeneration. The syncopal attacks vary greatly in intensity, and are marked rather by duration than intensity, and are not attended with complete loss of consciousness. He also speaks of attacks resembling *petit mal*, attended with slow pulse, sometimes less than twenty in the minute.

Interesting case of thrombosis and embolism in fatty heart observed. On setting the patient up in bed on one occasion, to examine his back, the writer did not hear him breathe, and on look-

ing at the patient he was to all appearances dead. There was no pulse, no sound over his heart, no respiration, his eyes were glassy and fixed, he could not swallow, and severe slapping of the epigastrium had no effect. After exhausting all available stimulants without good effect, the writer applied a lump of hot coal over the xiphoid cartilage and along the insertion of the diaphragm with tongs. This produced powerful contractions of the inspiratory muscle. Finally, by degrees respiration returned, eyes opened, heart beat, and color came to the face. He then administered some brandy, and at last the patient rallied. W. L. Symes (Dublin Jour. Med. Science, '92).

As to physical signs, there is a weak, irregular impulse that often can neither be seen nor felt; later dilatation supervenes. After the latter event the impulse is apt to be diffuse. The most constant and significant feature of the pulse is that it is short and unsustained (Broadbent). The area of cardiac dullness increases, and a soft systolic murmur is often audible at the apex (relative insufficiency). When fatty degeneration is associated with marked obesity, it is difficult to delimit the area of dullness, for obvious reasons, and the cardiac sounds on auscultation are apt to be weak, distant, and muffled. On the other hand, in thin subjects and in the fatty degeneration of grave anæmias, the first sound of the heart is often short, sharp (flapping in character), simulating the second sound.

Diagnosis.—It is to be emphasized that in a large number of cases the patient has not consulted his physician when sudden death supervenes from rupture, usually during active exertion or excitement; less frequently the termination in death follows the administration of an anæsthetic or a full meal. Rarely, death follows the action of the exciting cause after the lapse of several hours.

[In a large proportion of the cases there has been no ailment which has led the patient to consult a physician when he is overtaken by sudden death during exertion or excitement, or the administration of chloroform, or after a full meal; or the exertion or excitement may be passed through safely, and death follow some hours later, or even next day. Rupture of the heart is one mode of termination, and this may take place on very slight provocation. When the course of the disease has been sufficiently chronic to permit of the recognition of symptoms (which is chiefly when the degeneration is secondary to changes in the coronary arteries or to old-standing hypertrophy, with or without dilatation), they will be such as are produced by a slackening circulation, and they are not so different from those attending dilatation as to permit of any distinction's being drawn between the two conditions in an early stage without physical examination. In advanced stages characteristic differences appear. Marked dropsy is rare. The special effect of the disease is defective pressure in the venous system, and it is to this that the syncopal, apoplectic, and epileptiform attacks are due, which, together with angina pectoris, are the most characteristic later effects of fatty degeneration.

The pulse is short and unsustained. The rate may be regular or extremely irregular, and it may be frequent or slow. The physical signs are largely negative. If the fatty change is at all advanced, the impulse can be neither seen nor felt. The sounds are weak, and sometimes almost inaudible. WHITTIER, VICKERY, and GREENE, Assoc. Eds., Annual, '92.]

I believe that while fatty degeneration may be a sequel of coronary disease, sudden death in the latter is in the majority of instances to be ascribed to changes in the arterial coats and not fatty degeneration of the heart-walls, with ensuing rupture. Corroborative post-mortem evidence is not wanting. Key Aberg found extensive areas of fatty degenera-

tion only in two instances out of thirteen autopsies of sudden death from cardiac paralysis, brought about by sclerosis of the coronary arteries.

Case in which death occurred amid the symptoms of fatty heart followed by angina pectoris. The post-mortem findings showed the immediate cause of death to have been fatty degeneration of the heart. This did not appear to be dependent on atheroma or occlusion of the coronaries, which seemed everywhere sound and competent, though imbedded in an abnormal amount of fat. In places, as in the wall of the left ventricle below the auriculo-ventricular furrow at the apex, the muscular tissue was entirely replaced by adipose. Primary fatty degeneration of the heart found apart from valvular lesions or marked atheromatous change in the arteries in a young or middle-aged person with no known hereditary predisposition or diathesis is strongly suggestive of chronic alcoholism. In fact, it is regarded by some authorities as almost peculiar to this form of poisoning. E. P. Hurd (Boston Med. and Surg. Jour., vol. ii, '93).

The history, particularly if this points to the existence of arteriosclerosis, the age of the patient, and the symptoms of cardiac insufficiency coupled with retardation of the pulse (though the latter may be increased in frequency), apoplectic attacks, the Cheyne-Stokes respiration, in the absence of antecedent hypertrophy, may be regarded as significant features. Again, with a clear history of the presence of the more characteristic symptoms, including the signs of dilatation following hypertrophy, fatty degeneration may be inferred with some degree of assurance, and yet even this state of affairs should not lead to a positive statement of opinion.

In persons having reached middle life, in whom a weak and irregular action of the heart is manifested, it becomes an important question to decide whether this be due to functional disturbances or

organic disease. Broadbent states that usually this is accomplished by making the patient walk briskly. A few steps will often be sufficient. If the heart is sound it rises to the occasion. The pulse and beat sounds are all more distinct, and strong and regular, whereas the fatty heart "goes to pieces," and the pulse becomes irregular and shorter than ever or may even disappear.

Fatty degeneration may follow fatty infiltration of the heart, and while in consequence of this fact the two conditions are sometimes found in association, they are to be looked upon as separate and distinct morbid processes. In attempting to discriminate one from the other a recognition of the differences in causation is all-important. Fatty overgrowth is due to, and associated with, polysarcia, while the leading causal factor of fatty degeneration of the heart is arteriosclerosis affecting the coronaries, or atheromatous changes in the valves or walls of the aorta, causing obstruction at the mouths of the coronaries: conditions that would lead to weakness of the cardiac walls due to degenerative change. Among favoring causes of fatty degeneration are to be reckoned all the various factors that tend to bring about arteriosclerosis, as syphilis, diabetes, and alcoholic excess, though the latter may also act primarily upon the myocardium or the blood itself. Cases of fatty heart occur independently of coronary disease (*vide supra*). Thus, the disease co-exists with pernicious anæmia, chronic alcoholism, and not infrequently follows acute forms of disease, as acute aortitis and typhoid fever. In typical arsenical and phosphorus poisoning the fatty heart is constantly encountered.

The symptomatology of these two cardiac affections present differences of considerable significance. Both may exist,

however, without the production of symptoms, and both have symptoms in common, such, for example, as dyspnoea upon exertion, and arrhythmia, including reduplication. In fatty degeneration the volume of the pulse is diminished to a greater extent, and the disturbance of the rhythm of the pulse is also greater than in fatty infiltration. The breathlessness of fatty infiltration after exertion is associated with obesity; not so in fatty degeneration, as a rule.

The occurrence of "syncopal, apoplectic, and epileptiform attacks" in connection with the factors of etiological importance mentioned above, point strongly to fat-degeneration, and these symptoms are attributable to insufficient pressure in the arterial tree. Mild syncopal attacks may arise in fatty overgrowth, but when they become more severe, more frequent and prolonged, and particularly with associated coldness and clamminess of the extremities and body-surface, then fatty degeneration should be suspected. Much the same remarks apply to the symptom angina. The symptoms of bronchitis and asthma, either separately or combined, are oftener met in fatty overgrowth. In the latter condition the heart-sounds are weak and distant or muffled, owing to abnormal fat-deposits; in fatty degeneration, the sounds are short, flapping in character, due to associated dilatation, but they are clear, and an apical systolic murmur is not uncommonly audible. The so-called therapeutic test is an aid in the discrimination. Thus, as the result of appropriate treatment for the obesity the abnormal deposits of fat in and around the heart can be made to gradually disappear; with marked or even complete relief from the inconveniences occasioned thereby. On the other hand, slight temporary improvement, if

any, is all that can be hoped for in advanced fatty degeneration, or at a time when the diagnosis is reasonably assured. Finally, it may be said that the recognition of fatty infiltration is an easy matter, while that of fatty degeneration is scarce feasible until a late stage is reached. That form of fatty degeneration which follows compensatory hypertrophy is distinguished from fatty overgrowth by the special history, absence of obesity, and obviously dissimilar physical signs. It is to be recollected that dilatation following hypertrophy is not invariably due to fatty change.

Etiology.—Both in secondary and primary forms of hypertrophy, as well as in chronic myocarditis and chronic pericarditis, fatty degeneration may supervene. The degeneration of the cardiac walls dependent upon valvular disease, Bright's disease, and general arteriosclerosis is, perhaps, more often fibroid than fatty in nature.

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Valvular lesions produced artificially in dogs, cardiac hypertrophy ensuing. The compensation could only be broken by disturbing the innervation (*e.g.*, by section of the vagus nerve). Fatty degeneration of the heart of itself is not capable of producing loss of compensation. Phosphorus was administered to dogs with valve-lesions, and although at necropsy the heart was found quite fatty, compensation had been undisturbed. The writer maintains, therefore, that it is chiefly through disturbances of the nervous mechanism of the heart that failing compensation is brought about. R. Bulint (*Deut. med. Woch.*, Jan. 6-13, '98).

It is constantly met, also, in association with fatty change in other organs, in the severe forms of primary and secondary anæmias, and even more commonly, though of a less severe grade, in

the cachectic states produced by such chronic diseases as carcinoma and phthisis.

Results of investigations render it extremely doubtful whether the fatty changes found in pernicious anæmias are due to the blood-condition. Kraus and Chvostek (*Wiener klin. Woch.*, No. 33, '91).

The condition may arise in the course of acute infectious diseases of intense type, especially diphtheria and typhoid fever.

Fatty degeneration is extremely common in diphtheria, fatty degeneration appearing in 14 out of 19 animals (guinea-pigs, rabbits, kittens) inoculated with the bacillus diphtheriæ or its products. It appears to depend more on the intensity of the poison than on the time of its action. Simon Flexner (*Johns Hopkins Hosp. Bull.*, Mar., '94).

Certain toxic agents (arsenic, phosphorus, alcohol) are potent to cause a high grade of fatty degeneration. In the case of alcohol, it is only after long periods of intemperance that cardiac degeneration is established, and often only after primary coronary sclerosis. Besides sclerosis, which is an all-important etiological factor, the condition may be consequent upon a mere blocking of the mouths of these vessels.

Fatty degeneration is most common after forty years of age.

Fatty degeneration of the heart is an uncommon occurrence in early life. Case observed in a young man, aged 22, apparently robust, who, after a rapid walk of about two miles suddenly fell down, dying instantly. Marked fatty degeneration of the pericardium and heart was found. Lowther (*Brit. Med. Jour.*, Oct., '90).

It occurs somewhat more frequently in men than in women, notwithstanding the fact that there are predisposing influences at work in the latter that do not obtain in the male sex, such as childbirth and amenorrhœa. Whatever may be its

apparent etiology, it is invariably preceded by a defective nutritive supply to the muscle-cells; this may be dependent on mechanical causes, such as narrowing of the lumen of the coronary vessels, or upon impairment of the oxygen-carrying power of the blood, as in the anæmias.

[An important point in fatty degeneration is that the primary change is atrophy of the muscle-substance, and the fatty degeneration is secondary to this and consequent upon it. Disease of the coronary arteries being thus a cause of degeneration of the heart, the existence of conditions which may lead to the implication of the coronary arteries or their orifices in morbid processes will warrant a suspicion that cardiac weakness, which may be recognized, is the result of degeneration. But there may be fatty degeneration of the heart when the coronary arteries are healthy. It is usually present, sometimes in a very advanced degree, in pernicious anæmia, and granular degeneration, which is an acute form of the disease, is a constant effect of severe typhoid fever and of fatal phosphorus poisoning. Diabetes, alcoholic excess, and a sedentary mode of life may conduce to fatty degeneration of the heart, probably through deterioration of the blood, or it may be secondary to myocarditis. WHITTIER, VICKERY, and GREENE, *Assoc. Eds.*, Annual, '92.]

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Fatty degeneration of the heart is, as a rule, simply a consequence of starvation. This may be brought about through poverty of the blood itself, or through inability on the part of the blood-vessels to nourish the heart, owing to atheromatous changes in the vessel-walls or to chronic endarteritis. Mitral insufficiency and aortic stenosis are also not uncommon causes, by overworking the heart. The best agent for fatty degeneration is digitalis. Ernest B. Sangre (*Med. Brief*, June, '96).

Pathology.—The process may be either general or localized. Thus, when

circumscribed it may be limited to the uppermost or subpericardial layers, as when induced by pericarditis. The same minute foci and yellowish striæ may be observed in the superficial subendocardial layers, especially in the trabeculæ of the papillary muscles ("tabby-cat" striation). Blocking of one of the branches of the coronary artery (as a rule, the anterior) by a thrombus or embolus leads to the production of an anæmic necrosis or white infarct, which is often composed of fatty *débris*.

In general fat-degeneration the muscular substance throughout presents a pale- or a light- yellowish appearance, and is quite friable, the finger being readily thrust into it. Rarely, the color-tint is brownish in circumscribed areas from associated brown atrophy.

The various chambers of the heart are often enormously dilated with marked overstretching of the intracardial orifices. Coronary-artery diseases and atheroma of the arch of the aorta are among the most constant associated lesions.

In fatty degeneration the sarcous substance of the fasciculi is directly converted into globular fat, as contrasted with the condition of fatty infiltration, where the fat is deposited between the fasciculi.

There is only one condition—namely, phosphorus poisoning—in which fatty degeneration of the heart can be said to occur with sufficient regularity or in sufficient amount as to be of significance. Krehl (*Deut. Archiv f. klin. Med.*, B. 51, S. 417).

The occurrence of fatty degeneration of the myocardium in certain diseases in human beings is even at this time questioned by some authors. Notwithstanding the recent study and criticism of Krehl, it must be admitted that there are disease processes in human beings in which it is often present, and that in one class of affections—namely, chronic

heart disease with hypertrophy and dilatation of the organ—there can be no doubt of the common occurrence of fatty degeneration. The endeavor to make a fatty metamorphosis of the proteid constituents and cells dependent on the diminution of the oxygen supplied to them has not met with success. In the anæmias which occur in human beings, and can be produced experimentally upon animals, fatty changes are often absent or occur in only inconsiderable degree; and the effect of fever alone is all but established to have a relatively-slight importance in bringing about such changes as act injuriously upon the heart's function. Therefore it seems unavoidable to connect with the occurrence of fatty degeneration in its severer forms in the infectious diseases of man and animals a disturbance of cell-metabolism more nearly like that which phosphorus intoxication induces. The researches of Voit, Bauer, and others have shown that the fatty change is produced out of the proteid constituents and the cells. Flexner (*Johns Hopkins Hosp. Bull.*, Mar., '94).

Microscopically, the cell-fibres are observed to be displaced by minute granules and oil-globules, the latter first making their appearance at the poles of the muscle-nuclei; the striæ and nuclei become indistinct, and finally are wholly lost. The characteristic brown granules of brown atrophy may sometimes be visible, either at the extremities of the nuclei or uniformly distributed. The microscopical appearance of fattily-degenerated muscular tissue is sometimes confounded with albuminoid degeneration, but the form may be distinguished by the characteristic brown coloration when stained with osmic acid, and also the fact that on treating a section with acetic acid the fat-globules are not thus affected, while the albuminoid granules are dissolved.

It is questionable whether an ordinary microscopical examination of portions of the heart-muscle suffices for an

absolute recognition of fatty degeneration. Chemical examination strongly recommended. Krehl (*Deut. Archiv f. klin. Med.*, B. 51, S. 417).

Prognosis.—This is unfavorable. The increasing liability to sudden death must be steadily borne in mind (Tyson).

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Case of rupture of the heart observed occurring during the act of passing a soft-rubber stomach-tube for purposes of lavage in the treatment of a gastritis from which the patient was suffering. The patient was a woman, 60 years of age, and not particularly stout. The tube had just been passed into the stomach, without any excessive retching or straining on the part of the patient, when suddenly a pallor spread over the patient's face and her eyes rolled up. The tube was immediately removed, the patient was placed on her back, and every possible means used to resuscitate her, but she was dead. At autopsy the heart was found ruptured. Extensive fatty changes of the heart and liver were found. Greig (*Canadian Practitioner*, p. 81, Feb., '98).

While death often comes quickly, in the majority of instances the end is reached in a gradual manner, the signs and symptoms of advanced dilatation closing the scene. The frequent recurrence of syncopal, pseudo-apoplectic, epileptiform, and anginal attacks herald an early fatal termination. All known remedies are without avail in restoring the integrity of the degenerated muscle-tissue.

Treatment.—The cause in each individual case should be determined with precision if possible, and, if detectable, a bold attempt should be made to remove or moderate it. This course embraces in different cases many hygienic and dietetic considerations that assist in improving the nutrition of the cardiac tissue: one of the cardinal aims of a proper system of treatment.

Anæmia in one form or other often plays an important etiological rôle, and the particular variety present in each case must decide the character of the special remedies to be employed. Thus, pernicious anæmia would call for the exhibition of arsenic in gradually-ascending doses to the limit of gastric tolerance; chlorosis would demand, in addition to an appropriate hygienic regimen, the use of iron (*e.g.*, Bland's pills). In that large category of cases occurring in certain cachexias (cancerous or tuberculous) the following formula has, in my hands, given gratifying results:—

℞ Acidi arsenosi, 1 grain.

Ferri sulph., 30 grains.

Strychninæ sulph., 1 grain.

Quininæ sulph., 1 drachm.

Papoid, 30 grains.

M. et ft. capsulæ No. xxx.

Sig.: One after meal-time.

When the signs of cardiac dilatation become well established, rest, in the recumbent posture, should be strictly enjoined, owing to the danger of a sudden fatal rupture of the heart, and cardiac stimulants should be administered. Digitalis and strophanthus may be selected, but should be given with extreme caution, the commencing dose being small, and increased according to the effect in the individual case. In the form of a powder or an aqueous extract it may be conveniently combined with the prescription appended above.

For sudden heart-failure the diffusible stimulants (ether, ammonia, and alcohol) are to be resorted to. If marked arteriosclerosis be associated, then nitroglycerin and the nitrites are to be employed.

In cases of average severity I believe that gentle indulgence in physical exercise and light gymnastics is beneficial, since it tends to invigorate the heart-muscle; it is to be increased in propor-

tion to the improvement manifested in the patient's condition. Walking up ascents, however slight, is not to be advised for some time after the other, gentler methodic exercise has been commenced. It sometimes happens, however, that even slight exertion is badly borne, and it should then be promptly discontinued. In the latter class of cases I have been in the habit of advising daily inhalations of oxygen-gas, combined with complete rest and recumbency, with excellent results. Recourse to massage is also in the line of sound practice, but the sitting should not exceed half an hour in duration to begin with.

The more prominent symptoms may require special medication. Attacks of syncope are most successfully controlled by the hypodermic use of the diffusible stimulants (ammonia or ether), at the same time enjoining absolute rest, with the head lowered. For the angina pectoris, the combined use, hypodermically, of morphine (in small doses) and atropine is to be preferred, except in cases in which the apoplecticiform seizures, with a comatose tendency, are of frequent occurrence. Again, when the anginoid paroxysms are dependent upon coronary disease, recourse should be had to nitroglycerin and the nitrites. For the apoplectic attacks rest in the recumbent posture, with the head slightly elevated, is useful. Among therapeutic agents, digitalis, ammonia, and ether may be used hypodermically to stimulate the heart; it is also good practice to withdraw from 12 to 24 ounces of blood directly from a vein.

The life of the sufferer may be prolonged by giving him an abundance of sunshine and fresh air in favorable weather, but exposure to severe cold must be scrupulously avoided.

The *diet* should be simple, easily assimilable, though highly nutritious. I believe it to be an excellent rule to allow small meals at strictly regular, brief intervals. A light wine may be taken at dinner as an aid to digestion and nutrition. The bowels should be made to move rather freely and easily by means of properly-selected articles of food, and, these failing, mild laxatives.

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FAVUS. See *TINEA FAVOSA*.

FEVER, INTERMITTENT. See *MALARIAL FEVERS*.

FIBRINOUS BRONCHITIS. See *BRONCHITIS*.

FIBROID PHTHISIS. See *PHTHISIS*.

FISTULA, ANAL. See *RECTO-ANAL DISORDERS*.

FOOT, DISORDERS OF. See *VARUS*, *PERNIO*, *TUMORS (DERMOID for CORN)*, etc.

FORMALDEHYDE. — This gaseous compound, discovered by von Hoffman in 1867, is produced when a current of air charged with vapor of methyl-alcohol (wood-alcohol, or refined wood-spirit) is directed upon an incandescent spiral of platinum wire, or spongy platinum. By means of a suitable condensing apparatus a liquid called formol may be obtained, which consists of a solution of formaldehyde-gas in methyl-alcohol.

A watery solution of the gas is the formalin of commerce, which contains 40 per cent. of formaldehyde.

Formaldehyde is also known as formicaldehyde, methyl-aldehyde, and oxy-methylene.

Polymeric Modifications.—When formaldehyde is heated or strongly concentrated, it is converted into a white crystalline powder (paraform, or paraformaldehyde), which possesses most of the characteristics of formaldehyde, owing to its gradual reversion to the gaseous state.

When paraform is volatilized it reverts to the gaseous form, but is redeposited as a sublimate in the crystalline form (surgical dressings and bandages are impregnated with formaldehyde in this way).

When formalin (watery solution of formaldehyde-gas) is heated in a dish or vessel, formaldehyde is disengaged and, at the same time, paraform crystals are deposited on the interior of the vessel. Paraform, or the polymerized form of formaldehyde, is also known as paraformaldehyde, paraformicaldehyde, triformol, trioxymethylene, and dry formalin, and may be obtained in the form of white, crystalline powder, or molded into pastils.

Physiological Action.—Formaldehyde has an intensely irritating effect on the mucous membrane of the eyes and air-passages. Taken internally, in the form of paraformaldehyde, in doses as high as 90 grains, it produces no untoward effect. It is excreted by the kidneys. When injected subcutaneously in dogs, Pilliet observed congestion and degeneration change in the kidneys, liver, and spleen.

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Formaldehyde is a blood-poison. Introduced into the body, it causes excitement followed by slow asphyxia, and added to the blood outside the body it destroys the corpuscles and produces hæmatin. The last body is formed without any preliminary change of oxyhæmoglobin to reduced hæmoglobin. Benedicenti (*Arch. f. [Anat. u.] Physiol.*, H. 3, 4, p. 210, '97).

The ingestion of paraform has not as yet been followed by fatal poisoning. Concentrated aqueous solutions in contact with the skin are somewhat like carbolic acid. The skin becomes rough and whitish; a sharp stinging is felt if the skin is abraded.

Therapeutic Uses.—The chief use of formaldehyde so far has been as an antiseptic and disinfectant. It has, as such, been highly recommended by Trillat and Roux, of the Pasteur Institute.

DISINFECTION.—In disinfecting a room the doors, windows, etc., must be made perfectly tight, as the diffusive power of the gas is very high. The gas may be generated outside the room in one of the various generators to be had, and the gas conducted by a tube through the key-hole. Some forms of apparatuses are operated within the apartment. After a sufficient amount of gas has been set free in the apartment, it is left for twenty-four hours. Length of exposure appears to be secondary to the quantity of gas used. An excess is recommended by most authorities.

Superficial instruments, bed-pans, urinals, bedding, surgical dressings may be sterilized in small closets or in suitable receptacles. Formaldehyde does not seem to affect the coloring matter of the wall-paper, drapery, or garments (except light shades of violet and light red), and for this reason it is preferable to chlorine as a disinfectant for apartments. After the disinfection is completed the rooms should be aired for some hours, as the gas is very irritating to the throat and eyes.

Formaldehyde-vapor excels all other substances as a disinfectant. By using large quantities of the vapor for long periods of time a complete sterilization of the rooms and articles contained in them may be effected. Unlike chlorine, it has no detrimental effect upon such

articles. Philipp (Münch. med. Woch., Nov. 20, '94).

Formalin, which is the name of a 40-per-cent. solution of formic aldehyde, is superior in its germicidal action to corrosive sublimate in solutions of a strength which can be well tolerated. The spray of a solution as dilute as 1 in 2000 is sufficient to sterilize a culture diphtheria bacillus. It is of value in bacteriological class-work and in the sterilization of instruments, as well as for the hardening and preservation of tissues for microscopical purposes. W. W. Alleger (Lancet, June 30, '94).

The various lamps are too small and give uncertain results. Two methods proved to be highly effective against the various bacteria with which rooms were infected: One by spraying the walls, furniture, etc., with a 2-per-cent. solution and allowing the room to remain closed for twenty-four hours; 60 to 70 cubic centimetres of solution are enough for a square metre of surface. The other by evaporation from sheets dipped into a solution of half a kilogramme of calcium chloride in a litre of formaldehyde and hung in the room. The room is left closed until the next day. A sheet of two square metres is enough for eight cubic metres of space. The method by spraying is a very cheap process, but those engaged in the work must protect the eyes by a special form of glasses and the hands with gloves or vaselin, and must use a cotton-wool respirator. Nils Englund ("Om Formaldehyden," Stockholm, '95).

Pastils made of the solid polymerized formaldehyde (trioxymethylene) recommended. Each pastil weighs 1 gramme, and contains 100 per cent. formaldehyde, which is evolved by heating on a quite simple apparatus. After carefully closing all crevices in the room, the lamp of the apparatus is lit, and then the door closed. By burning one pastil for each cubic metre of room space, the author found that all non-spore-bearing organisms placed in any part of the room were killed after twenty-four hours. Aronson (Zeit. f. Hyg., Leipzig, B. 25, H. 1).

Formaldehyde is not superior to the

present recognized methods. The spraying of rooms with sublimate, a much cheaper operation, is quite as effective. It is of distinct service, however, for superficial disinfection of substances harmed by the spray or high-pressure steam. Abba and Rondelli (Zeit. f. Hyg., Leipzig, B. 27, H. 1).

Fresh and dry tubercle bacilli are killed with comparative ease, but, on the whole, the agent is not well suited to general disinfection. Many difficulties present themselves, many lamps are needed, and the agent is a bad one for handling. It cannot be used in a compressed form in cylinders, since it goes from monoformaldehyde into tri-, hexa-, and other higher polymers, which are indifferent bodies, hardly to be considered as disinfectants. E. Pfuhr (Zeit. f. Hygiene u. Infects., xxii, 339).

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New lamp for disinfecting-purposes, consisting of a disk of moderately thick asbestos-board perforated with small holes close together and platinized with a strong solution of platinic chloride, and a lamp-font, which is a shallow, cylindrical dish of such size that the disk will just cover the top. This font is partly filled with methyl-alcohol. The disk is wet with the alcohol and removed from the dish, and then the alcohol is ignited. By the time the alcohol burns away the disk is sufficiently heated so that when placed over the lamp-font again it will continue hot and change the alcohol to the aldehyde most efficiently. The amount of alcohol converted in a given time depends on the size of the disk; with one of six inches' diameter a litre can be converted in an hour.

At least a quart of alcohol should be used in disinfecting an ordinary living-room; this amount will yield about thirty-six volumes of the aldehyde-gas, which, as such, or in solution, is practically without injurious effect on metals, wood, cloth, and most colors. F. C. Robinson (Jour. of Amer. Public Health Assoc., Oct., '96).

Opperman used a 60-per-cent. solution of formaldehyde in methyl-alcohol, which

be called holzin. Personal experiments with the latter solution in combination with a small quantity of menthol to do away with its irritating properties. This fluid, "holzinal," evaporated slowly from a small apparatus, obtains perfect sterilization of the air and all objects in the room without injury. Even food is rendered absolutely free from germs by it. It has a favorable influence upon whooping-cough in all stages. When used in a solution as weak as 1 to 100,000 it prevents the development of bacteria, and a solution of a strength of 1 to 75,000 is germicidal. Formaldehyde was further given internally in a solution of milk-sugar (called sterisol). Examination of the urine shows that it is taken up by the blood, and is separated from it by the kidneys so slowly that its germicidal action in transit must be considerable. Rosenberg (Deutsch med. Woch., Nos. 39 and 40, '96).

Formaldehyde, 1 to 125,000, kills anthrax bacilli; 1 to 50,000 prevents the development of typhus bacillus; 1 to 25,000 forms a useful injection in leucorrhœa; 1 to 2500 destroys the more resistant micro-organisms in one hour; 1 to 500 is useful for the irrigation of catheters and as a mouth-wash; 1 to 200 or 1 to 250 is a general disinfectant solution for washing hands and instruments, spraying in sick-rooms and as a deodorant; 1 to 100 is used for lupus, psoriasis, and other diseases of the skin. F. C. J. Bird (Amer. Jour. Pharm., No. 11, '96).

Exhaustive experiments, leading to following conclusions: "1. Formalin in the strength of 1 to 10,000 arrests the growth of the germs of anthrax, cholera, typhoid fever, diphtheria, and staphylococcus pyogenes aureus. 2. In the gaseous form it arrests growth, even when greatly diluted. 3. In 1-per-cent. solution it kills pure cultures of pathogenic germs in an hour. In diluted alcoholic solutions the effect is more intense. 4. In 3-per-cent. solutions, especially with the addition of alcohol, the hands may be freed from all germs. More extended investigations are necessary to show the degree to which the skin is affected. 5. By spraying artificially infected matter with formalin solution, and afterward in-

closing it in air-tight vessels, such matter may be sterilized. 6. By means of formalin (or, in other words, formaldehyde) leather articles, uniforms, etc., may be thoroughly disinfected in large quantities, and without in any way injuring these articles; twenty-four hours' exposure is requisite for such disinfection. The possibility of disinfecting rooms may be considered as demonstrated by other experts. 7. Fæces are almost instantly deodorized by a 1-per-cent. solution, and are disinfected (germ-free) in ten minutes by a 10-per-cent. solution. 8. Formalin acts well as a caustic. 9. It is an excellent preservative." Walter (Zeit. f. Hyg., vol. xxi, '96).

Formaldehyde very satisfactory when using 1 pound of formaldehyde per 1000 cubic feet, or 1 quart of wood-alcohol for the same space, and prolonging the actual time of generating the vapor to from one to three hours. Wyatt Johnston (Brit. Med. Jour., Dec. 25, '97).

Not only is formaldehyde a germicide, but it renders innocuous the toxins of tetanus, diphtheria, and many other organisms. It is of great value for disinfection of rooms. A 1-per-cent. solution deodorizes fæces. It is a far safer agent than corrosive sublimate, because it is not actively poisonous. It will satisfactorily disinfect the hands, will disinfect instruments without dulling them, and is a valuable agent in the sterilization of catgut. To wash wounds a 2-per-cent. solution to be used; to irrigate, a $\frac{1}{4}$ -per-cent. solution (Willard). Strong solutions are irritant even to sound tissues, and are used when we wish a caustic effect, as in chancroids or poisoned wounds. Vaginal gonorrhœa is benefited by irrigation with a solution of a strength of 1 to 1000, and the cervix can be painted with a 4-per-cent. solution (von Winckel). H. C. Wood (University Med. Mag., June, '97).

As the results of experiments made with formalin pastils burned in Schering's apparatus, conclusions reached, viz.: that formaldehyde is valuable as a surface disinfectant, and, as it does not injure the most delicate fabrics or papers, it can be used in any such apartment with safety. It failed, however, to

kill germs wrapped in newspapers, although forty pastils were used in a room containing 1000 cubic feet of space, the time of exposure being twelve hours. Doty (*N. Y. Med. Jour.*, Oct. 16, '97).

Better results obtained in municipal disinfection by the use of formalin without any apparatus than heretofore with the various devices. Sheets suspended in the room were simply sprayed with the 40-per-cent. solution through a common watering-pot rose-head. A sheet of the usual size and quality will carry from 150 to 180 cubic centimetres of the solution without dripping, and this quantity has been found sufficient for the efficient disinfection of 1000 cubic feet of space. Of course, the sheets may be multiplied to any necessary number.

Cultures, both moist and dry, were exposed for five hours in these experiments—some in sealed envelopes and others wrapped in three thicknesses of sheets, or folded inside of woolen blankets. Of the former, none showed growth after seventy-two hours' incubation, while the growth was but slight in those wrapped in the blankets. Surface-disinfection was thorough, while a much greater degree of penetration was shown in these experiments than that secured by any other method.

The evolution of the gas from the sprinkled sheets is exceedingly rapid, so much so that it behooves the operator to vacate the room within a very few seconds.

After five hours the density of the gas is still so great as to preclude respiration until after doors and windows have been opened some time. Chicago Health Dept. (*Jour. Amer. Med. Assoc.*, Apr. 23, '98).

For formaldehyde disinfection Lingner has constructed an apparatus consisting of a vessel in which the water is boiled. The steam rises into a reservoir which contains 40 per cent. formaldehyde and 10 per cent. glycerin. This mixture is termed "glycoformal." From this reservoir four pipes pass out into the room. A room of sixty cubic centimetres is so filled with vapor in ten minutes that an electric lamp placed in the centre is no longer visible. All microbes are de-

stroyed in three hours at the latest. The windows are thrown open for half an hour after the disinfection. Liquid ammonia is then placed in the room in an amount proportionate to the formaldehyde used. The windows are again opened, and thus all smell is got rid of. This method of disinfection can be carried out by the unskilled. Schlossmann (*Berl. klin. Woch.*, June 20, '98).

Formaldehyde has no penetrating power; it acts best in dry air with high temperatures. It exerts no injurious action on furniture and other objects disinfected, and it is the most expensive of all processes. Symanski (*Zeit. f. Hygiene und Infects.*, Aug. 19, '98).

Formaldehyde has the property of hardening nitrogenous substances of the nature of gelatin. Cunningham (*N. Y. Med. Jour.*, Apr. 20, '95) makes use of this property in the preparation and sterilization of catgut. After this method of preparation the catgut can be boiled without destroying it.

GYNÆCOLOGICAL DISORDERS.—In vaginitis and catarrhal endometritis a tablespoonful of a 10-per-cent. solution of formalin to a quart of water has been found useful.

Formic aldehyde used in one hundred and fifty-five cases of diseases of women. It is an efficient remedy in vaginitis and catarrhal or blennorrhagic endometritis. It was used in the form of vaginal injections, 1 tablespoonful of a 10-per-cent. solution of formal to a quart of water, together with cauterization of the cervix and intra-uterine mucosa with the same 10-per-cent. solution. Von Winckel (*Les Nouveaux Remèdes*, Apr. 24, '94).

Under the influence of the injections of formaldehyde in gonorrhœa, a rapid disappearance of the gonococci from the discharges observed, while the character of the latter was changed from purulent to serous. The injections should not contain more than 5 per cent. of formaldehyde. Orloff (*Wratsch*, July 4, '95).

Six cases of gonorrhœa treated with formalin. In every case the gonococcus was found. A 1/2-per-cent. solution used

for injections. For the first two or three days irrigations of 1 quart of hot formalin solution were given twice daily; afterward once daily till the discharge ceased to contain the gonococci. No internal treatment was given except cathartic pills. All highly-seasoned food, alcohol, tea, and coffee were prohibited. The patients were advised to drink 2 or 4 quarts of pure water in the 24 hours. J. T. Howland (*Jour. of Cut. and Genito-Urin. Dis.*, 227, June, '96).

Literature of '96-'97-'98.

Good results claimed from the use of formaldehyde in gonorrhœa in women. Sixty cases, some very obstinate, were cured. The vulva was washed with a 1 in 1000 solution, and the vagina douched through a speculum with a strong solution, varying from 2 in 1000 to 5 in 1000. If the uterine cavity and cervical canal were involved, some of the same solution was injected. When there is laceration of the cervix, tampons soaked in 1 in 1000 of formaldehyde are left for two to three hours in the vagina. When fungous endometritis is present, the curette must be first applied. The applications give rise to no pain, and may be used daily, or every second day. De Smet (*La Semaine Méd.*, June 3, '96).

VESICAL AND URETHRAL DISORDERS.

—Lamarque recommends the use of a 1-per-cent. solution for irrigating the bladder and urethra and a 5-per-cent. solution in chronic gonorrhœa. In hæmaturia and tuberculous cystitis it has also proved of value.

Formol in 1-per-cent. solution used for washing out the bladder and urethra, and in 5-per-cent. solution for instillation in these localities. It is particularly in cases of tuberculous cystitis that the treatment has been successful. The only disadvantage is the pain caused by the drug; this, however, though intense at first, quickly ceases. Daily washings with formol solution have been effectual in stopping hæmaturia, relieving pain, and lessening the frequency of micturition in cases where every other treatment had failed. In gonorrhœa the re-

sults were not satisfactory. Lamarque (*Le Mercredi Méd.*, Sept. 11, '95).

CUTANEOUS DISORDERS. — Poitevin suggests the application of a layer of absorbent cotton dipped in a 2-per-cent. formalin solution and covered with an oil-silk or rubber bandage in parasitic diseases (ringworm) of the skin. Its vapors diffuse readily, even through masses of fatty matter, which makes it specially suitable for the treatment of deeply-implanted diseased hair, and also for the disinfection of the hair-follicles filled with sebaceous matter. In case of irritation of the skin, the bandage may be removed for a day. It has also been recommended in cases of psoriasis and lupus as a local application.

Literature of '96-'97-'98.

Good results from the use of the 40-per-cent. solution of formaldehyde painted on in ringworm of the scalp; 40 cases were thus treated, and microscopical examinations, made both before and after the application, showed the trichophyton to have disappeared in each case. A temporary irritation and the production of a thick crust rendered the subsequent application of an emollient advisable. Œdema of the face, unaccompanied by pain or constitutional disturbance, was a remarkable complication in 6 of the cases, but was only noticed when the area painted was large. Salter (*Brit. Med. Jour.*, vol. ii, p. 650, '96).

When a watery solution of gelatin is allowed to dry in formalin-vapor the chemical characteristics of the gelatin are altered. It is no longer affected by hot or cold water, nor by acids or alkalies. Animal tissues, however, have the power of breaking up the combination and setting the formalin free. When the formalin-gelatin, ground to a fine powder and mixed with cultures of various forms of pathogenic bacteria, was introduced into animals, the bacteria did not develop, and the wounds healed without trouble.

With this formalin-gelatin powder every acute suppuration can be stopped

in twenty-four hours, and wounds made to heal aseptically.

The writer has used it in 120 cases of acute suppurative processes, in 93 aseptic wounds, 4 compound fractures, and 2 deep scalp wounds. The wounds were only cleansed mechanically, and then thoroughly rubbed with the powder.

In cases of necrotic masses, in old ulcers, etc., the formalin-gelatin powder is dusted on the wound, and then covered with a dressing wet with the pepsin solution and the digestive process keeps up a continuous supply of formaldehyde-vapor for the wound. The powder is made by drying 500 grammes of purified and dissolved gelatin in the vapor of 25 drops of formalin. Schleich (*Therap. Monats.*, Feb., '96).

Schleich's formalin-gelatin marks a distinct advance in the treatment of supuration, giving the most perfect results in those cases where the cellulitis is moderate and the pus abundant. E. M. Foote (*Med. News*, Nov. 14, '96).

OPHTHALMIC DISORDERS.—Formaldehyde has been recommended as a disinfectant in ulceration of the cornea, the solution generally preferred for collyria being 1 to 2000. Stronger solutions should be applied immediately to the seat of the ulcer.

Excellent results obtained in infecting ulcers of the cornea and in purulent conjunctivitis. Corneal ulcers may be touched with a solution of 1 to 200 or 1 to 500 every day. For general use as antiseptic collyrium a strength of 1 to 1000 or 1 to 2000 may be used. S. M. Burnett (*Ophthalmic Rec.*, vol. v, No. 9).

Literature of '96-'97-'98.

Solution of 1 to 2000 of service in muco-purulent and follicular inflammations of the conjunctiva, when applied thrice a day to the everted lids. In trachoma it seems to have the power of reducing the amount of secretion. S. Stephenson (*Brit. Med. Jour.*, Jan. 25, '96).

The most serviceable solution of formaldehyde is 1 part of formalin to 2000 or 3000 of water. This is of very great

value when used freely in infected abrasions of the cornea and in hypopyon ulcers. J. M. Davidson (*Ephemeris*, p. 1843, Jan., '97).

DISORDERS OF THE RESPIRATORY TRACT.—In the treatment of diseases of the nose, larynx, and lungs formaldehyde has been recommended by a number of observers, in solutions ranging from 2 to 40 per cent. Although these reports merit credence, the fact remains that the irritation produced is such as to deter many from using it in preference to other means.

Excellent results obtained in the treatment of rhinitis, otitis media, and laryngitis by passing through the nose a stream of air which had bubbled through a solution of 5 per cent. of formalin in water. Deschamps (*Annales des Mal. de l'Oreille*, etc., Apr., '94).

Literature of '96-'97-'98.

Inhaler devised for the treatment of pulmonary tuberculosis by formaldehyde which produces a vapor of 2-per-cent. to 10-per-cent. strength. The odor may be disguised by Austrian pine. The coughing-spells become less troublesome and the quantity of fœtid expectoration is diminished. Rosenberg (*Deutsche med. Woch.*, Nos. 39 and 40, '96).

In the treatment of laryngitis and chronic nasal affections the writer places a 5-per-cent. solution of formalin in a glass carafe and instructs the patient to inhale the vapor which arises therefrom on shaking the vessel. This treatment is carried out two or three times a day and lasts from five to ten minutes. In the treatment of acute laryngitis the results are most favorable, a complete cure being arrived at in from seven to twenty-four hours in the sixteen cases in which it was tried. In three cases of acute coryza the condition disappeared in twenty-four hours after the use of three or four douches of a weak formaldehyde solution. Yateouta (*Revue de Thérap.*, Apr. 15, '97).

In atrophic rhinitis after removal of all the crusts and *débris* with a weak alkali-

line solution, each nostril is thoroughly washed out with a solution of formaldehyde, containing 5 to 10 drops of the 40-per-cent. solution to 8 ounces of warm water. As it is very irritating, a preliminary spraying of the nose with cocaine is advisable. At home patient has 1 drop added to the solution used in the douche-cup for the daily cleansing. Under use the crusts diminish in number and all unpleasant odor ceases. George L. Richards (N. Y. Med. Jour., vol. lxxvii, p. 826, '98).

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FRACTURES.

Definitions.—The sudden, forcible destruction of the continuity of a bone, in whole or in part, except when done with a cutting instrument, is called a fracture (Stimson). More briefly, a fracture is a laceration or crushing of a bone. A *simple* fracture is one that is not compound or comminuted. A *compound* fracture is one in which a wound of the soft parts establishes a communication between the fracture and the outer air. The fracture is *comminuted* when the bone is splintered. *Multiple* fractures, on the other hand, are several separate fractures in the same bone or in several bones (but this term is not applied to a simple fracture of one forearm or leg). A *spontaneous* fracture is one produced by an insignificant violence. A fracture occurring on account of a predisposing disease of the bone is called *pathological*. An *ununited* fracture is one in which bony union has not taken place after the lapse of the usual length of time. The terms *delayed union* and *fibrous union* usually express the same condition. A "green-stick" fracture is an incomplete fracture of the shaft of a long bone accompanied by a bending of the bone.

Varieties.—The following is the simplest classification:—

1. Incomplete fractures:—

- (a) Fissure.
- (b) True incomplete "green-stick" fracture.
- (c) Depressions.
- (d) Separation of a splinter or apophysis.

2. Complete fractures, subdivided according to

- (a) The direction and character of the line of fracture,—as transverse, oblique, longitudinal, dentate, V- or T- shaped, and comminuted.
- (b) The seat of the fracture, as fracture of the shaft of the neck, head, shaft, separation of the epiphysis, etc.
- (c) If extending into a joint, intra-articular fractures.

3. Multiple fractures.

4. Compound fractures.

5. Gunshot fractures.

Symptoms.—**DEFORMITY.**—Under this head are included all the changes in appearance and dimension of the injured part. Some deformity is always present, dependent upon the contusion or laceration of the soft parts, or, what is much more important, the displacement of the bone-ends upon each other. This displacement may take place in six ways (Malgaigne), though the actual displacement is usually the result of a combination of several of the original ones. These six primary displacements are: 1. Transverse or lateral. 2. Angular. 3. Rotary. 4. Overriding. 5. Impaction or crushing. 6. Direct longitudinal separation. Displacement is caused by the combination of the trauma and the muscles attached to the fragments. Most of the various displacements can be recognized by the eye or finger, but if the seat of the suspected fracture is covered

by a thick layer of soft tissues, and especially if the contusion of these soft parts has given rise to a considerable amount of superficial deformity, mensuration must be resorted to. Measurements are best taken from bony points at opposite ends of the bone whose fracture is suspected, and the shortening or lengthening ascertained by comparison with the distance between the corresponding points on the opposite side of the body (*e.g.*, the sound limb). Unfortunately, however, it is often impossible to take measurements with any degree of accuracy from two points on the same bone, consequently the rule that must always be borne in mind, *viz.*: for a comparison of the measurements of the sound and the injured limb these measurements must be taken with the limbs in not apparently, but really corresponding positions. Two other sources of error are: first, that the length of limb in some subjects is normally asymmetrical; and, second, that previous disease may have affected the length of some one of the bones measured. Circumferential mensuration of a limb is valueless, for the increase in circumference of the injured limb, in cases where the bone deformity cannot be readily made out, is usually due more to the effusion of blood into the soft parts than the overlapping of the bone-ends. The deformity of the soft parts is such as is caused by whatever contusion or laceration they may have received. Generally speaking, the swelling increases for twenty-four to forty-eight hours, and then gradually subsides, its subsidence being hastened by treatment: a fact which is of the greatest importance in reference to the application of splints.

ABNORMAL MOBILITY and crepitus are the two other objective symptoms of fracture and are pathognomonic. In ex-

posed positions the former sign may be elicited by directly grasping the segments of the bone and moving either upon the other; in other cases (fracture of the surgical neck of the humerus) the surgeon must be satisfied with determining that the motions (rotation) of one fragment (the shaft) are not imparted to the other, as indicated by the immobility of one of its bony points (the greater tuberosity). Again, abnormal mobility near a joint may simulate abnormal mobility of the joint itself, and special care be necessary to differentiate between fracture and dislocation.

CREPITUS is the grating sensation heard or felt when the two rough bone-ends rub against each other. The intervention of soft parts between the bone-ends, of course, prevents crepitus, which may, on the other hand, be simulated by crackling of coagulated blood, by roughened joint-surfaces, by teno-synovitis, and by emphysema. Finally, be it especially noted that although abnormal mobility and crepitus are pathognomonic, they are often by no means necessary to the diagnosis of fracture, and the manipulations which they require may be not only extremely painful, but also, by producing further lacerations of the soft parts, positively harmful to the patient.

LOSS OF FUNCTION is usually present to a greater or less degree and is due to the weakness of the part or to the pain evoked by motion or pressure; but this symptom is liable to be misleading, for, while one patient may use a fractured limb with great freedom, another may be totally disabled by a mere contusion.

PAIN.—This is always present, except when the patient is unconscious, and is either spontaneous or aroused by pressure or movement. The characteristic pain of a fracture is localized over the point of fracture and may be elicited, not

only by pressure over this point, but also by pressure at other points along the fractured bone. Such a pain, together with a history of injury, may sometimes constitute sufficient evidence of fracture, notably in fracture of the ribs or of the fibula.

CLINICAL PICTURE.—Immediately after the accident the torn vessels pour out their blood into the tissues, and within a few hours œdema sets in on account of the occlusion of the lacerated veins and lymphatics and the obstruction of others by the pressure of the extravasated blood. The temperature may rise a degree or two, blebs appear on the surface, and the tense skin discolored by ecchymoses. The discoloration which may appear a few days later, as the blood extravasated among the deeper tissues makes its way to the surface, perhaps at some distance from the point of fracture, is a presumptive sign that a bone-lesion exists. In from one to five days—more rapidly under appropriate treatment—the œdema subsides and the swelling is reduced to a hard lump, the mobility of the fracture becomes less, crepitus is no longer obtainable as the fractured bone-ends become covered with granulations, and, finally, after a few weeks abnormal mobility entirely disappears and the fracture is said to be united. But the patient is not yet well. Disease has stiffened the joints and weakened the muscles so that several weeks or months will be required before the limb regains its usefulness, while in cases where the proper care of the joints has been neglected they may remain permanently stiffened.

Diagnosis.—The degree of fracture should always be made with the least possible manipulation. A consideration of the patient's history, together with careful inspection, gentle palpation, and

accurate measuring will usually suffice. If not, gentle manipulation of the injured part may be made use of for the purpose of eliciting abnormal mobility or crepitus. To this end general anæsthesia is of great assistance by relaxing muscular spasm and removing pain; but with these safeguards against further laceration thus removed, manipulation should be doubly gentle. Moreover, a slight, gentle movement will often be of service when a brusque or violent one will fail.

In obscure cases the use of the X-rays by fluoroscope or sciagraph may be resorted to instead of anæsthesia; but when operative interference is necessary, or when complete insensibility is requisite for the "setting" of the fragments, the use of the rays is not called for. In fact, the safe rule is to use the rays for diagnosis as little as possible, for dependence upon the ordinary clinical data and the careful use of trained eyes and fingers are productive of far better clinical results than is the use of an instrument whose finding may be misleading and which tends to shroud the clinical aspect of the case in the silvered cloud of scientific accuracy. In doubtful lesions about joints, however (notably the hip and shoulder), and in supposed fractures of the spine or pelvis, the rays may be of great service, and they are of undoubted use also in some cases where operation for non-union is contemplated, and occasionally to determine the condition of the bones of a limb in fixed splint. Their application to scientific and statistical investigation is beside our subject.

Differential Diagnosis.—**DISLOCATION.**

—In dislocations there is abnormal motion where there was motion before. In fractures there is motion where there was none before. Moreover, if, in dislocations the range of motion is increased in

one direction, it is usually diminished in the opposite direction, while a fracture usually gives abnormal mobility in all directions. Crepitus is pathognomonic of fracture.

CONTUSION.—Position and pressure for a few days ought to reduce the swelling of the soft parts sufficiently to permit a satisfactory examination. Contusions of the hip form the exception. If even the X-rays fail to clear up the diagnosis satisfactorily, the only safe treatment is that for fracture.

If every "dislocated wrist" and every "contused hip" were regarded and treated as a fracture, the world would be none the worse for it.

Etiology.—**PREDISPOSING CAUSES.**—

Sex, age, and occupation are remote predisposing causes of fracture. Men suffer more frequently from fracture than women, for they are much more often exposed to injuries of all sorts. Yet after the age of seventy, women suffer many more fractures than men, chiefly of the neck of the femur. Again, while by far the greater number of fractures occur in the first three decades of life, the proportion of fractures *per capita* is at its maximum at about the age of sixty. More definite predisposing causes, however, reside in the anatomical and pathological condition of the bones and the system in general. Normally, the shape, structure, and functions of various bones expose them more or less to fracture, the liability to which is increased by the changes incident to advancing years. The curves in the long bones and their broad spongy ends, so well adapted to transmit the minimum of danger to more vital organs, render them, for that very reason, more liable to give way under excessive violence. Seventy-six per cent. of all fractures occur in the ribs, clavicle, forearm, hand, and leg, while the upper

extremity, the weapon of offense and defense, receives 51 per cent. of the total. The middle aged and the aged, while less exposed to trauma than the young, receive more than their share of fractures, partly because of their decreased agility, the normal stiffening of their muscles, but mainly on account of the normal changes in the osseous system. As age advances, the spongy and the compact tissues of the bones become gradually rarefied, not by any changes in the proportions of their bony constituents, not by any deposit of lime-salts, but by an actual diminution of the amount of the bone-tissue. Such changes are pathological only when they occur at an early age. In a few cases an unlimited tendency to this early bone-rarefaction has been observed. Such fractures usually heal kindly, and refracture through the line of union is the exception, although, in the more pronounced forms, the patient may scarcely have convalesced from one fracture before some slight accident disables him with another one. A similar bone-fragility may be acquired through prolonged disuse or consequence of lesions of the nervous system.

Rachitis in children and in later days syphilitic bone-lesions, bone-tumors, and inflammations act as predisposing causes of fractures, and notably delay, if they do not entirely prevent, the process of repair. The existence of rheumatism as a predisposition is very doubtful, the pathological connection between the two not having been demonstrated, and the clinical history of "aches and pains" probably a mere coincidence.

DETERMINING CAUSES.—These either come from without in the shape of trauma, or from within as muscle-action.

External violence may be applied directly (direct violence) to the part of the limb that breaks, or indirectly (indirect

violence), and it then acts by leverage, vibration, or the associated muscular action. The effect of molecular vibration as a cause of fracture is sometimes seen in bullet wounds. A bullet, for instance, passing cleanly and with no shattering through the lower end of the tibia, has been known to comminute the head of the bone into a number of small fragments, although leaving the major part of the shaft intact, a result only attributable to vibration, and quite comparable to the splitting of a baseball-bat near the handle by impact with a ball at some distance from the point of fracture. The "explosive" action of bullets on the skull is similarly attributed to the waves set up in the soft contents of the cranium.

The distinction between fractures by direct and indirect violence is an important one in compound fractures, for the greater laceration is likely to be at the point of impact, and consequently in the former class the wound is usually large and irregular, while in the latter it is commonly a simple puncture by a sharp bone-end, a distinction which intimately affects the treatment.

Muscular action is the usual cause of fractures of the patella.

Pathology.—We need not concern ourselves here with the lacerations and the process of repair of the soft parts. As for the bone, it may give way more or less completely and in one or more places (see *VARIETIES*). If the fracture amounts to anything more than a simple fissure, the periosteum is torn and usually stripped up for some distance. As a rule, however, it remains untorn at one side, thus forming a so-called "periosteal bridge"; a valuable adjunct to repair, and tending to insure the life of all fragments that remain attached to it.

The bones are displaced, as we have seen, in various ways, and if the displace-

ment is considerable and the bone-ends angular, a great deal of damage to the soft parts may result from injudicious handling, a secondary compounding of the fracture being a not infrequent result of carelessness in manipulation and transportation, especially in fractures of the leg.

BULLET WOUNDS.—Recent researches are tending to clear up the mystery surrounding the contradictory reports on the effect of modern projectiles. A slowly-moving bullet, one almost spent, if it strike a bone will bore through it more or less completely and splinter it more or less widely in a manner that can be explained by the velocity, the angle of impact, and the quality of the bone; but with a swiftly-moving, small-calibre bullet, another force has to be considered,—that of vibration. If the vibration imparted to the bone by the projectile is such that the point of impact of the projectile coincides with a nodal point, the bullet will simply pierce the bone and no shattering will result. But if the point of impact does not coincide there will be more or less shattering at the point and at the extremities of the bone, the amount of shattering being dependent on the amount of vibration imparted to the bone. Now, the qualities in the bullet that tend to produce vibration are its momentum (weight and speed), which is imparted more or less to the bone as the bullet is larger or smaller and at its point is harder or softer. Consequently the shattering power of a bullet increases with its velocity, its weight, its size, and its capacity to flatten out when it strikes a hard object.

In bullet wound of the cranial cavity, and to a less degree of the thoracic and pelvic cavities, the amount of damage is, again, often dependent on the vibrations produced, the waves set up by the pas-

sage of a solid object through a semifluid medium, more or less hermetically sealed within an unyielding envelope. Whereas the even passage of the bullet does comparatively little damage, the waves of motion it produces may suffice to literally blow the top of a man's head off.

THE PROCESS OF REPAIR.—The first attempt at repair is seen in the periosteum, which throws out a layer of granulations. These become cartilaginous and finally bony, being the only portions of the callus to pass through a cartilaginous stage. The bone and marrow also share in the separative process, but to a less extent. They throw out granulations, which combine with these from the periosteum to fill the whole space between the bone-ends, even the medullary canal (forming the so-called "medullary plug"). The bone acts more slowly than the periosteum on account of the relative scarcity of its cellular elements, and because it has the added task of dissolving and making away with the thin layer of bone-substance which is infallibly destroyed at the point of fracture. The callus thus thrown out forms a large irregular mass, whose size is increased in proportion to the degree of displacement, the amount of comminution, and the lack of immobilization. If the callus is thus rendered unduly large, it may involve adjoining tendons, nerves, or joints, thus complicating recovery. If the line of fracture runs into a joint, it may become permanently immobilized by osseous union of its articular surfaces.

Fragments detached from the periosteum may regain their vital connections by revascularization of their Haversian canals, or they may remain imbedded in the callus as innocuous foreign bodies. In this condition they may ultimately lead to suppuration.

If the vital energy of the bone-forming

elements is not sufficient to form bony union, the callus remains fibrous. The usual causes of fibrous union are systemic debility, separation of the fragments, faulty immobilization, and the presence of foreign bodies,—*e.g.*, wire sutures.

Ultimately the medullary plug is absorbed and the callus becomes entirely bony, shrinking, in cases that have been completely reduced, almost to a simple layer between the bone-ends, any sharp angles of which are also gradually rounded off by absorption.

Repair of Compound Fractures.—If they heal by first intention their repair follows the same course as that of simple fractures, but when suppuration occurs partly detached fragments that would otherwise have lived are cast off, and the ends of the larger fragments also die, and act often for long periods of time as foreign bodies to which sinuses run, after all active suppuration has ceased. In such cases the dead bone should be cut down upon and removed. After suppuration none of the callus goes through a cartilaginous stage.

Prognosis.—The prognosis depends on many conditions, the extent of the injury, the associated lesions, and the age and general condition of the patient. Again, the prognosis for certain fractures (clavicle, Colles's) is far better than for others. Among the accidents that may imperil the patient's life are *embolism* of a clot from an injured vein into the heart or lung, causing instant death (see *EMBOLISM*), or *fat-embolism*, a very rare condition which occurs during the first few days after fracture. The symptoms may be those of embolism or shock, or there may be more or less characteristic signs of œdema of the lungs. Post-mortem examination reveals the fact that the pulmonary capillaries are obstructed by minute globules of fat, which have been

poured into the gaping vessels from the torn bone-marrow. If the patient recovers the diagnosis of fat-embolism cannot be made with any certainty.

Shock is a frequent cause of death, which usually occurs within the first forty-eight hours, and in compound fractures death may occur from hæmorrhage, or later from tetanus or septicæmia or pyæmia. Delirium tremens is a frequent complication. The shock, the withdrawal of customary alcoholic stimulation, and the confinement to bed all tend to induce it. Besides the customary administration of hypnotics, stimulants, and nourishment, it is of the greatest importance to get such patients up and about while they are still in the premonitory stage of restlessness and insomnia. They must be gotten out of bed at any cost. I have seen this expedient succeed in abating an attack of delirium tremens when all other means bade fair to fail. Finally, gangrene may result from laceration of the main vessels of a limb or from their compression, whether by the displaced fragments or by a splint unskillfully applied.

Local sloughing of the tissues may occur from the pressure of a sharp point of bone, or, more commonly, by extravasated blood. The reduction of the fracture, followed by the application of heat and pressure and the elevation of the limb, constitute the elements of prophylaxis in such cases, to which must be rarely added incisions for the evacuation of clots or the ligature of bleeding-points.

Other early complications are the secondary compounding of the fracture by a sharp point of bone, and the formation of a traumatic aneurism in a lacerated artery.

Complete recovery may be delayed or prevented by exuberant, painful, or weak callus. The callus always is "exuberant"

at first, and may be expected to grow somewhat smaller even after bony union has taken place, but experience has proved that large masses of callus that impair function will not disappear in the course of nature nor under any medical, mechanical, or electrical treatment. They must be exposed and chiseled away, and in this connection it is well to remark that in old cases it may be impossible to tell before operation whether the offending mass is a badly-reduced fragment or exuberant callus. Persistent pain in the callus may be due to pressure on a nerve or the inclusion of nerve-filaments in the callus, or to suppuration about a sequestrum. If the pain cannot be explained, it is called "osteoneuralgia." Weakness of the callus, if not caused by undue separation of the fragments or constitutional debility, is usually due to inefficient immobilization. It is not an uncommon consequence of suppuration in a compound fracture.

Stiffness of the joints is, to a certain extent, the natural result of the immobilization necessary to secure union in the fracture. But this stiffness should be transitory except in the old and rheumatic, or unless the joints are sprained or involved in the fracture. In this last event permanent bony union of the opposed bone-surfaces may occur, or exuberant callus may interfere with the movements of the joints. The joints of the fingers, however, are very liable to remain stiff if they are immobilized for more than two weeks, especially if in the position of extension.

Atrophy of the muscles may be permanent in old and debilitated persons. In whom also spontaneous dislocations and fragility of the bones may result from disease.

Tumors—primary sarcoma and secondary carcinoma—may occur at the seat

of fracture, and secondary carcinoma may occur in the epithelium lining of the old sinuses of compound fractures.

Permanent paralysis may result from laceration of or pressure on the nerves.

Treatment.—**REDUCTION.**—The surgeon's first duty, unless the associated injuries or shock demand immediate attention, is to "reduce" or "set" the fracture; that is, to restore the fragments to their normal position, or at least to that position in which he intends them to unite. This first step in the treatment, and the next one, immobilization, must be carried out as soon as possible in order that the displaced fragments shall do no further damage to the soft parts. Of course, in such fractures as do not need reduction (*e.g.*, ribs) immobilization is alone required. If the patient's general condition contra-indicates such extensive manipulations as are required to reduce a complicated fracture, the bones must be immobilized as completely as possible in their abnormal positions. In compound fractures, moreover, special indications exist for primary immobilization. These will be discussed in a subsequent paragraph. Reduction should not be made if the spongy tissue of the bone has been crushed so severely that if the distal fragment were replaced in its normal position a gap would exist between the fragments.

To effect reduction the least possible force must be applied. Ordinarily speaking, gentle traction is made upon the distal fragment by the hands of an assistant, while the surgeon manipulates the broken ends, bringing them gently into position. General anæsthesia may rarely be necessary to relax the muscles.

Immobilization is effected by means of splints. Any dressing used to immobilize a fracture is called a splint. Of tem-

porary emergency splints, the simplest and most generally applicable are made of wood. They should be broader than the limb to prevent constriction when they are bandaged to it, and, generally speaking, longer than the fractured bone. They should be padded on the side next to the limb and should be light and yet strong enough to maintain the bones in their proper positions. These splints are held in place by a roller bandage or strips of adhesive plaster.

Generally speaking, nothing should be applied to the limb under the splint except some elastic substance, such as cotton or wool,—the so-called carded wool makes the most comfortable (and expensive) dressing,—which will equalize the pressure of the splint and absorb the perspiration of the limb. In some cases, however, it may be deemed advisable to apply about the seat of fracture a number of coaptation splints: small thin pieces of wood, about an inch broad and some six inches long, wrapped in cotton, which, when bound about the limb at the seat of fracture, keep the bone-ends in apposition by direct pressure. But it must be borne in mind that they do not prevent angular deformity.

As a general rule, in applying splints the joints at the extremities of the fractured bone should be immobilized.

If dressings are applied circularly to a limb they imperil its circulation and may give rise to gangrene if any swelling occurs in the limb subsequent to their application. Consequently they should not be used until the primary swelling has occurred, and, when used at any time, they should be frequently inspected.

Bony excrescences should be protected by padding *about* them, not *on* them.

Permanent wooden splints may be constructed after the fashion described above. Carved wooden splints are

troublesome and expensive to obtain, and have no peculiar advantages.

Gooch's flexible wooden splint (Fig. 1) combines the advantages of lateral and coaptation splints. They are made by fastening a number of thin strips of wood side by side. Molded splints have almost certainly replaced them at the present day.

Fracture-boxes have been almost universally supplanted by more convenient apparatus. They are used only for fractures of the leg and are essentially a combination of a posterior splint with a movable foot-piece and two lateral splints




Fig. 1.—Gooch's flexible wooden splint.
(*Stimson.*)

hinged to it. The fractured limb is placed on the posterior splint appropriately padded, the padding folded over the splint, and the sides turned up. It may be suspended like a Hodgen or Smith splint with advantage. The heel is protected from pressure by the same device as serves in

VOLKMAN'S SPLINT.—This is as good as any temporary splint for fractures of the leg. It is a simple gutter of tin of such a length as to reach six or eight inches above the patient's knee. At its lower end a U-shaped piece is cut out to admit the heel, and to this end is

attached a foot-piece, which is supported on an inverted T-shaped rest. To apply it the gutter is filled with cotton or wool and a bandage applied over leg and splint. The heel may be protected either by padding very snugly for some distance up the leg on either side of the tendo Achillis or else by attaching a piece of adhesive plaster to the back of the leg and the sole of the foot and attaching to it another piece of plaster which is carried over the toe of the foot-piece and stuck to its base. The former method allows the foot to sag, the latter does not.

MOLDED SPLINTS.—Wire gauze is a convenient material to mold over a limb for a light splint. Leather and felt are similarly made use of. After being thoroughly soaked in water they are molded and bandaged to the limb and allowed to dry in place. Gutta-percha previously heated and molded has also been used. All of these have, however, been supplanted by plaster-of-Paris and silicate-of-soda (artificial glass) splints. To make a plaster splint a number of thicknesses of gauze, muslin, or blanketing of the desired dimensions are immersed in a freshly-made solution of plaster-of-Paris of the consistency of thick cream (a small amount of common salt or, better, sulphate of zinc added to the fluid makes it harden quicker) until the material is thoroughly impregnated. It is then squeezed out and applied to the limb which has been coated with vaselin in the meanwhile. If the splint must turn a sharp angle (elbow or heel) it can be fitted by notching its edges and overlapping the edges of the notches. It is then bandaged in place until it dries, after which it may be retained by a few turns of the bandage or adhesive plaster. Such splints are not very strong (but may be strengthened by incorporating in

them rods of iron or wood), but they offer the great advantage of allowing the fracture to be inspected with the minimum of disturbance. The plaster bandage is most conveniently made by rolling a gauze bandage loosely, filling it at the same time with dry plaster. The bandage is allowed to soak for a few minutes in a hot, weak solution of sulphate of zinc and is then applied to the limb previously incased in a thin layer of cotton or a stocking. The bandage is best applied as an "anterior reverse," without actually reversing, however. Dextrin, starch, glue, and silicate of soda (the last being the best) are similarly used. The most convenient way to apply such bandages is to rub the solution into each layer of the bandage after it is applied. Silicate-of-soda bandage is more elegant than the plaster-of-Paris, but it is not so strong nor does it "set" so quickly. Such bandages may be fenestrated by cutting out a piece of the plaster after it has hardened, or interrupted by incorporating in the two sections of the splint the ends of two or three —  shaped and straight bands of iron. Such interruptions are likely to weaken the splint. To cut a plaster splint for fenestration or removal the best instrument is a short, sharp, stout-bladed knife, whose efficacy is enhanced by wetting the line of section with dilute hydrochloric acid. To prevent shortening the splint must have points of counter-pressure at opposite ends of the fractured bone. The edges of fenestration may be protected by rubber tissue or varnish.

The toes and fingers should always be left exposed, and they should be frequently inspected during the first few days in order that the splint may be removed in case it interferes with the circulation. If the patient is then to pass

from the constant observation of the surgeon he should not be allowed to go until he has been watched for twenty-four hours with his limb as dependent as it will be during the convalescence. Then he and his friends must be carefully instructed as to the dangers of which coldness, swelling, and discoloration of the digits are the forerunners, and warned to report before gangrene has set in. Subsequently it will be well to inspect the splint once a week in order to be sure that the limb has not shrunk enough to allow motion at the seat of fracture. A good routine rule is that the splint shall be reapplied every ten days.

AMBULATORY SPLINTS.—We seem to have seen the crest of the wave of the "ambulatory" treatment of fractures, in which, as in all things else, there is some measure of virtue. In a certain sense every patient who walks on crutches is receiving an ambulatory treatment for his broken leg, but in that there is nothing new, nor in the application of one of the many forms of hip-traction splints, so long used for the treatment of disease in that joint, to fractures of the femur. The novelty, the real "ambulatory" splint, is a heavy plaster-of-Paris bandage splint reinforced with a ring of several extra turns of the bandage just under the tuberosities of the tibia and usually strengthened by incorporated bands of iron or strips of wood in such fashion that the weight of the body is transmitted from the head of the tibia to the ground, not through the splint, the foot being elevated by a sole of cotton or wool at least two inches thick or by a steel "stirrup," which is incorporated into the plaster and upon which the patient walks. The advantages claimed for this method of treatment are that it avoids the risks of confinement in bed and shortens convalescence by lessening the atrophy of

the muscles and the stiffness of the joints. On the other hand, such splints cannot be used with safety in every oblique fracture or in fractures that allow any great mobility, and they certainly increase the danger of mobility within the splint. Moreover, some patients absolutely refuse to "amble," and those who will walk are usually able to get as much comfort out of a light, comfortable plaster splint and a pair of crutches as they can from such a cumbersome appliance. That they cannot get out of bed sooner than with crutches is evident, and that the convalescence is shortened by walking on the ambulatory splint does not seem to have been absolutely proved; yet in some cases they may prove very satisfactory.

TRACTION.—Continuous traction must sometimes be combined with immobilization, notably in fractures of the thigh. Elastic traction involving complicated apparatus and exercising an indefinite force has been superseded by the weight and pulley. As the various apparatus are designed only for fractures of the femur, they will be described under that title.

DIRECT FIXATION.—Very rarely necessary or advisable except in compound fractures, in fractures of the patella (and possibly of the olecranon), and in cases of delayed union. Of course, if, for any other reason, such as the removal of a fragment, it is desirable to cut down the seat of fracture, it is but discreet to throw a few supporting sutures about the bone-ends to insure their more accurate apposition. In so doing the one important caution to be borne in mind is that any bone transfixed or constricted by a metallic peg, plate, or suture is liable to become necrotic. Consequently some absorbable gut or silk is the only form of suture material that may be used with safety. And, as a matter of experience,

it may be added that periosteal sutures of stout catgut seem to last long enough to fulfill every requirement. It is true, however, that wire sutures may be used if their ends are left long, so that they may be untwisted and extracted at the end of ten days or two weeks.

MASSAGE.—In the first week massage hastens the disappearance of the swelling, and if used during the whole convalescence notably lessens the subsequent stiffness and atrophy (Lucas-Championnière), but the expense of such treatment as well as the danger of disturbing the fragments nullifies these slight advantages in most cases.

MANAGEMENT OF THE JOINTS.—During the early stages of convalescence the joints should be immobilized and subjected to massage and elastic compression if they show any marked inflammatory reaction. Later, when the acute stage has passed they may be subjected to systematic passive motion, the massage and pressure being continued. Passive motion should never be insisted on, however, as long as its use causes persistent pain or increases the stiffness. Indeed, ordinary use is the best form of exercise. Forced passive motion (*brisement forcé*), with or without anæsthesia, should never be attempted, for it is sure to be detrimental, unless the obstruction is a single slight band whose rupture would not be followed by any great reaction: a relatively rare condition. If gentle passive motion prove ineffectual, the joint may be subjected to dry heat (300° F.); and, this means also failing, if greater mobility is absolutely essential, recourse may be had to open arthrotomy with systematic division of adhesions or the removal of any obstructing callus. In addition be it noted that in the larger joints stiffness rarely persists, but in the smaller ones it may be permanent. This

is notably the case with the *extended* fingers. Fingers should always be immobilized in the fixed position, and passive motion on them never postponed beyond the end of the second week.

COMPOUND FRACTURES.—If the wound leading to the fracture is small, clean, and not contused, as is usually the case, in compound fracture by indirect violence, the wound and any projecting ends of bone should be thoroughly cleansed, the fracture reduced with as little enlargement of the external wound as possible, the wound loosely sutured, and primary union expected. In case the wound heals aseptically the course is that of a simple fracture, but, if suppuration sets in, the wound must be promptly opened up, thorough drainage provided for at dependent points, and irrigation instituted either continuously or, at least, often enough to keep it mechanically clean until healthy granulations occur, after which the healing is concluded under local treatment appropriate to granulating wounds.

If, on the other hand, suppuration has already set in or seems inevitable from the contusion or the dirty condition of the tissues, provision must be made at once for thorough drainage, and the preliminary irrigation must be copious, better results being obtained from irrigation with large quantities of a weak solution than with smaller quantities of a stronger one, whose irritating properties kill the tissues as well as the bacteria. Yet even the most desperate cases may do well if after this extensive cleansing they are left alone for five or six days in the hope that during that time partial healing may at least diminish the size of the abscess-cavity and perhaps shut off the bone from it entirely. Of course, in the presence of evidences of existing suppuration, the sur-

geon may not hesitate to institute the most vigorous antiseptic treatment, but in doubtful cases the disturbance incident to frequent changes of dressing will certainly result in suppuration, while the expectant treatment may have a happier issue.

The necessity of removing detached fragments of bone depends almost entirely upon the prospect of suppuration. In a clean wound fragments that are entirely detached may lie, while in the presence of pus even the ends of large fragments will be cast off.

To estimate the amount of sloughing that will occur Esmarch's artificial ischæmia is a safe guide, those parts being doomed to which the blood does not flow on the removal of the bandage. But it is inadvisable to attempt any extensive clearing away of dead tissue until the bone has begun to granulate and the line of demarkation has formed.

The suture of periosteum, fasciæ, muscles, nerves, and tendons and the ligation of bleeding vessels merit no especial notice here.

As to the indications for resection or amputation, no definite rules can be laid down. In cases of doubt, however, it is always safe to delay amputation until it is clearly impossible to save the limb. Thus the patient is given every chance and the surgeon may avoid being sued for malpractice.

As to suppurating compound fractures of the larger bones they need almost never be despaired of, from twelve to eighteen months being none too long for their ultimate and satisfactory recovery.

PSEUDARTHROSIS, OR DELAYED UNION.—When on account of a constitutional taint (*e.g.*, syphilis), a drain on the system (pregnancy, lactation), a cachectic condition, or most commonly an imper-

fect reduction or inefficient immobilization of the fragments, the fibrous callus which unites the fragments fails to ossify after a sufficient length of time has elapsed, the bone-formation should be stimulated by attention to the patient's general condition and such measures as will produce local irritation. Among the local measures the most successful have been the production of congestion by occasionally constricting the limb above the point of fracture for a sufficient time to cause decided venous congestion, the injection of a few drops of a 10-per-cent. solution of the chloride of zinc into the callus, the use of electricity with one needle in the callus and the other on the surface of the limb, or the wearing of a splint loose enough to allow a slight amount of motion at the point of fracture. These failing, the only alternative is to cut down on the fracture, to cut away the callus, and suture the bones into place with catgut. If a gap remains this is to be filled by decalcified or powdered bone. A gap in the tibia may be done away with by removing a section of the fibula. The use of wire is contra-indicated here as elsewhere, except for temporary service.* One need scarcely add that if the defective union is due to the general condition of the patient, no amount of operating will make the fracture unite so long as that condition persists.

Nearthrosis, a very rare condition, in which the bone-ends are separated by a joint-cavity, demands operative interference.

Faulty or angular union may be remedied by osteotomy.

Special Fractures.

Fractures of the Skull.—VARIETIES.

—Instead of dividing these fractures, according to their location, into fract-

ures of the vault and of the base, it is more intelligible to speak of

1. *Circumscribed fractures*, with little injury to the brain.

2. *Fissured fractures*, usually associated with serious brain-lesions.

3. *Intermediate and irregular fractures*—the intermediate fractures that combine some of the features of each of the above varieties.

Circumscribed fractures being usually caused by a sharp blow from some pointed object, the skull is crushed locally, without any great injury to the underlying parts. In typical cases, after the shock of the blow has passed off there is no further danger or inconvenience, except the danger of infection, for almost all fractures of the skull are compound. Sometimes the outer table alone, again (but rarely) the inner table alone, and usually the whole thickness of the skull is depressed. Yet there may be no depression, the skull being simply split (locally) at the point of fracture.

The *diagnosis* may be easily made by inspection and palpation. If, however, the fracture is not compound, a ridge of clotted blood may feel like the overhanging edge of the uninjured bone over a depression; but in the case of the clot the finger goes up one side of the ridge as well as down the other, and does not simply slide over the ridge, and firm pressure will indent the clot, but not the skull.

FISSURED FRACTURES.—These fractures are caused by the "binding" or "bursting" of the skull under pressure applied broadly. They are the "indirect" fractures of the skull, just as the circumscribed fractures are "direct." Consequently fissured fractures are much more common in the base, and circumscribed fractures more common in the vault. The bursting force may make

itself felt in a radial direction or in a direction at right angles to this, and the fissures are therefore usually dispersed in one of these two directions, although the irregular thickness and elasticity of the skull, especially its base, is liable to impart to the fissure a ziz-zag course. The fissure may occur only at some point quite distant from the point of impact and is there often termed a *contrecoup*, a misleading term, for there is no *contrecoup*. On the other hand, the fissure may be so extensive as to allow the two halves of the skull to be freely movable upon each other. Since the cause of those fractures is generally a blunt instrument, they are less often compounded than the circumscribed fractures.

These fissures being due to a bursting of the skull on account of a sudden change of shape of the whole globe, it is readily understood that the associated lacerations of and hæmorrhage into the contained structures are likely to be very extensive and to prove rapidly fatal, not in any sense on account of the fracture, but on account of the trauma that caused the fracture.

DIAGNOSIS.—Fissures in the vault are often compounded and thus readily diagnosed. Care must be taken not to mistake a lacerated aponeurosis for a fissure of the skull. In fissures of the base, however, the diagnosis can rarely be made except by inference. As these fissures often involve the petrous portion of the temporal bone, rupturing the tympanum, hæmorrhage from the ear, mouth, or nose is a fairly-accurate diagnostic sign of fracture of the base. The diagnosis is, however, of very little importance.

INTERMEDIATE AND IRREGULAR FRACTURES.—Most fractures of the skull are, in a sense, intermediate between the

two great divisions of circumscribed and fissured fractures, for with every sharp blow there is seen to be some compression of the whole globe, and even the bluntest force, if applied with sufficient momentum, will cause a local crushing. But an understanding of the two great classes will elucidate all such cases. Exceptionally the brain is compressed by the blood effused, beneath a circumscribed fracture, and its evacuation is followed by immediate relief of symptoms; but, we repeat, such cases are exceptional.

PUNCTURES.—Those which cause a local fracture are very liable to produce a local brain-lesion and to lead to infection; hence they present special therapeutic indications.

RING FRACTURES around the foramen magnum are caused by a sudden blow upon the buttocks which forces the spine up into the skull, carrying a ring of the basilar portion of the occipital bone along with it.

PATHOLOGY.—A piece of depressed bone may lacerate both dura and pia and even the brain. In so doing it may tear the great sinuses or the middle meningeal artery. If the fracture involves the inner ear, the hearing may be permanently lost. Various nerves and vessels and the cord itself may be torn at their points of exit from the skull. Any amount of brain-laceration may accompany the fracture.

Process of Repair.—Most of the membrane-formation is done by the diploë, the osteopoietic faculties of the pericranium and dura being very slight. Consequently there is very rarely any superabundant callus, and consequently, too, if a piece of skull is removed it will be replaced only by fibrous tissue, and not by bone.

PROGNOSIS.—The gravity of the prog-

nosis depends on two things, either of which may exist without any fracture at all, namely: the damage to the brain and its adnexa, and infection. The importance of depressions of small areas of the vault has been unduly magnified. Stimson strongly advises against meddling with simple depressed fractures unless focal symptoms present themselves. It is certainly absurd to suppose that the depression of a square inch of bone to the depth of half an inch or so could cause the severe and lasting shock that is so often attributed to such an injury, nor should the elevation of such a splinter be expected to relieve these grave disorders.

TREATMENT.—Simple Fractures.—Attend to the general condition of the patient and leave the fracture alone unless focal symptoms present themselves as the result of a depression or a hæmorrhage from the middle meningeal artery. In such cases operate to elevate the depression or to stop the hæmorrhage. Many surgeons hold that all depressed fractures should be elevated at once. As the choice lies between the problematical danger from the existing depression and the real danger from possible infection, the question cannot be said to be definitely settled.

Compound Fractures.—Operate immediately for the purpose of cleansing the wound. Fill the wound itself with gauze wet in bichloride 1 to 10,000, then shave and cleanse the whole scalp, or at least half of it. Next enlarge the skin-wound if necessary in order to catch all bleeding-points and to expose the laceration of the soft parts. If there is any depressed bone it can usually be elevated by prying up the most elevated corner and extracting this piece by gentle manipulation with the forceps, after which the rest will follow easily. Occasionally

the chisel or trephine may be necessary; but in all compound fractures the bone must be elevated for the purpose of assuring the asepsis of the subjacent tissues. Having elevated and removed the splinters the whole wound is copiously irrigated with "normal" salt solution. If any intracranial hæmorrhage persists, the wound must be left packed with sterile or iodoform gauze for forty-eight hours, after which it may be closed. If there is no bleeding the dura is sutured; if torn, and the pericranium, aponeurosis, and skin sutured in layers, the first three with catgut, the last with silk. An aluminium, silver, or celluloid plate or a sheet of gold-foil or rubber tissue may be interposed in the gap left by the removal of fragments of bone in order to strengthen the scar.

If a fissure of the skull appears in the wound, it should be thoroughly cleansed as far as infection may have traveled, the wound being slightly enlarged and the edge of the fissure chiseled away for this purpose, if necessary. There is no object in endeavoring to find the limits of the fissure, which may extend half-way around the skull or even farther. If from the force of the blow a depression of the inner table seems possible, that is no indication for increasing the patient's risks of brain-infection by trephining. Such depressions are extremely rare, and unless they give rise to focal symptoms they are innocuous.

Punctured wounds should always be opened up, the punctured part of the skull being entirely removed by the trephine and the whole wound then irrigated and drained. Bullets located near the surface may be removed at once; if deeper and not to be touched by gentle probing, they had best be left alone, as their presence does not materially influence the prognosis. If they give rise to

symptoms later, they may be located by the X-rays and their removal attempted with a greater prospect of success. Infection from the air-passages in fractures of the base cannot very well be guarded against. It is futile to render the middle ear aseptic when germs may constantly reach it through the Eustachian tube.

Fracture of the Vertebrae.

The importance of fractures of the vertebrae, like those of the skull, is dependent almost entirely on the amount of damage done to the inclosed nervous tissues; on this the symptoms, prognosis, and treatment depend.

SYMPTOMS.—The symptoms are mainly those of an injury to the spinal cord. If the displacement is such as to compress or tear the cord, paraplegia results, with loss of control over the vesical and anal sphincters, and in the male priapism usually occurs. Locally there is tenderness and pain, increased by motion, ecchymosis, and deformity, and crepitus in some cases.

DIAGNOSIS.—Except the deformity and crepitus, any or all of the above symptoms may be caused by injury to or disease of the cord without any fracture of the spine. Hence the diagnosis is generally obscure; but no manipulation should be undertaken for the purpose of elucidating it, for fear of precipitating a fatal issue. Fracture and dislocation are usually associated, and their differentiation is of no clinical importance.

In estimating the location of the injury, it must be remembered that the pressure symptoms may be due as well to hæmorrhage or inflammation as to the displaced bone, and also that it may take twenty-four to forty-eight hours for the paralytic symptoms to appear at their distinctive level. Hence the local symptoms of pain, tenderness, and deformity

are much better guides to the level of the lesion than the paralytic and anæsthetic symptoms.

ETIOLOGY.—Indirect violence by causing an excessive bending of the spine is the common cause of fracture. Such violence may be applied by a fall of the subject himself or by some heavy body falling upon him. Less frequently muscular violence produces a fracture of the spine, the usual location of such fractures being the cervical region and the usual cause a sudden jerking backward of the head: as to avoid striking the bottom when diving in shallow water.

PATHOLOGY.—The crushing force which causes the fracture is very likely to cause a simultaneous dislocation.

The bodies of the vertebrae are the parts most affected, except in the cervical region, where the transverse and articular processes are more frequently injured. Direct violence occasionally tears away the spinous process. There is no regularity about the fractures, however, every conceivable variety having been observed. The upper fragment is usually displaced forward on the lower one and the cord is compressed, rarely torn across, between the two. Subdural hæmorrhage or secondary meningitis may give rise to still further compression. The nerves that make their exit at that particular segment are usually torn, as are the attached muscles and ligaments.

PROGNOSIS.—*Fractures of the Lower Three Lumbar Vertebrae.*—In fractures of this region only the cauda equina is liable to compression, and its individual components can usually slip aside from any obtunding fragment, and thus there will be no pressure symptoms. Under appropriate treatment the bones unite and the patient may recover entirely or with a weak back, or with paralysis or pain from pressure in some of the nerves.

Fractures Above the Second Lumbar.—

The prognosis as regards life and death varies with the amount of damage done to the cord. If the cord is permanently damaged, the patient may continue to live as long as two months, only to die finally of exhaustion or of septic infection from bed-sores or catheterization. Death may be instantaneous from shock or from involvement of the phrenic nerve in the laceration. In fractures high up in the cervical region, even of the atlas and axis, death is not always instantaneous, but the least movement or jolt may be enough to bring fatal pressure to bear on the cord.

TREATMENT.—In all manipulations the greatest care must be exercised to avoid the production of farther displacement. The patient must be kept upon a water-bed, catheterization must be conducted with every precaution, and the bladder irrigated daily with a saturated watery solution of boric acid, or, if cystitis supervenes, with a 1 to 4000 solution of nitrate of silver. Pressure must be taken off spots where bed-sores threaten, and, if they occur, they must be kept clean and dry by antiseptic powders. Nor must the patient's general vitality be neglected. As long as there is any hope of recovery electricity and massage to the paralyzed muscles are advantageous, and the strictest cleanliness must be insisted upon. The curative measures are mechanical and operative.

Mechanical Treatment.—This originally consisted in traction upon the head and feet by two assistants while the surgeon endeavored to reduce the fracture by direct manipulation. More recently suspension and the application of a plaster jacket, as for Pott's disease, has afforded some good results, and a similar treatment is that of Dr. Woodbury's, who applied the jacket to a child upon

whom traction was being made while it lay face down upon a hammock of cheese-cloth. Dr. Stimson advocates suspension along a plank, the plaster being applied while pressure is maintained on the protuberance.

Operation.—The so-called laminectomy is done through a long vertical incision with its centre over the fractured vertebræ. The bone is bared and the spinous processes of three or four of the vertebræ removed. Then with Rongeur forceps the laminae are divided on either side as close as possible to the transverse processes. The dura is then exposed and if distended with pus or blood it is incised and drained. Otherwise it is gently retracted and the bodies of the vertebræ are palpated. Any unevenness in them is removed, the straightening of the whole column attempted, and the wound closed without drainage, unless hæmorrhage or suppuration demand it.

The results of operation have been so unsatisfactory even at the hands of its most earnest advocates, and the effect of traction and the plaster jacket so manifestly advantageous, that the mechanical method is the treatment of election even though operation has occasionally disclosed and remedied pathological conditions upon which no manipulation could have exercised a beneficial influence.

Fracture of Nasal Bones.—The nasal bones, cartilages, and septum may each and all be fractured. Such fractures may be followed by tedious suppuration, facial emphysema, plugging of the lacrymal canal, and, as the displacement is always backward, some subsequent deformity is inevitable, unless they are replaced.

DIAGNOSIS.—By endeavoring to move the upper and lower parts of the nose laterally upon each other, false motion and crepitus will thus be elicited.

TREATMENT.—This must be begun promptly, for osseous union has been known to occur by the tenth day. By means of a director passed within the nostrils the bones are replaced. The only retentive apparatus of any value is a long pin passed directly through the nose and resting on either cheek, the nose being covered with a piece of adhesive plaster. As a general rule, however, there is no tendency to reproduction of the deformity, and, even if such a tendency does exist, frequent reposition will appeal to the patient rather than the transfixion treatment.

In old unreduced fractures an artificial bridge of aluminium celluloid, or gutta-percha may be introduced and is well borne.

Fracture of the Malar and Superior Maxillary Bones.—Fractures of these bones beyond the subsequent liability to suppuration and emphysema are of no particular importance. If a fracture of the zygoma threatens a serious deformity, it may be remedied by inserting a sharp hook under the process and so elevating it. Fractures of the alveolar process of the jaw with displacement should be treated by wiring the teeth, or by an interdental splint (*vide infra*).

Fractures of the Lower Jaw.—The body, the ramus, the condyle, or the coronoid process may be fractured. Fractures of the body are, by far, the most common. They are almost always compound and occur usually in the middle line or else are double, one on each side. Unilateral fractures are comparatively infrequent. The displacement is usually vertical and from before backward, as well. It may be appreciated by the finger inside the mouth. In fractures of the ramus there is little or no displacement. In those of the condyle that process is usually drawn for-

ward on to the eminentia articularis, the lower fragment slipping up into the glenoid cavity and so causing the chin to deviate to that side.

The diagnosis is easy except in fracture of the ramus, where local tenderness and pain on closing the jaws may be the only symptoms.

TREATMENT.—A mild antiseptic wash should be employed frequently to lessen the danger of infection and to clear the mouth of the foul and acid discharge from the wound. Under such treatment with efficient immobilization the wound



Fig. 2.—Four-tailed bandage for fracture of lower jaw. (*Stimson.*)

may be expected to heal kindly, though occasionally it is impossible to prevent suppuration and necrosis.

IMMOBILIZATION.—Though reduction is easy, the deformity tends to reproduce itself, to overcome which tendency a great number of mechanical devices have been introduced. The principles employed are external pressure, exemplified by the four-tailed bandage (Fig. 2), wiring of the bone or teeth (several on either side lest they pull out), and the interdental splint. This is a piece of gutta-percha or vulcanized rubber

molded to fit between the upper and lower teeth and of such width as to hold the jaws slightly separated so that fluids may be introduced through a hole bored in its centre. This is applied and the jaw bound firmly by a four-tailed bandage. The first two methods may prove satisfactory; but the dental splint, though more complicated, is quite sure to give satisfaction if it is made by an expert dentist.

Fracture of the Hyoid Bone, the Larynx, and Trachea.—These rare fractures are usually caused by direct violence, as in strangulation. They may be recognized by direct palpation. They endanger life by obstructing respiration. If the symptoms are urgent, tracheotomy should precede attempts at reduction.

Fracture of the Sternum.—This accident is very rare. It is usually caused by the strain of bending forward or backward. The symptoms and treatment are those of dislocation (*q. v.*).

Fractures of the Ribs.—These are frequent, though often multiple, and occur usually between the fifth and ninth. The upper and lower two ribs are almost never fractured. In single fractures there is, as a rule, no displacement; but multiple fractures may give an angular displacement, or, if sufficiently extensive, a caving in of the whole side of the chest. The fracture may be located by a localized point of tenderness (and crepitus), which may be elicited by pressure on the shaft of the bone at a distance from the fracture. Crepitus may also sometimes be elicited by deep inspiration, which is painful. If the lung is pierced there may be cellular emphysema, hæmoptysis, and later a pneumothorax.

TREATMENT.—Displacement having been corrected, the bone is immobilized by strapping the chest with adhesive

plaster. During expiration a strip of plaster two inches broad is applied, beginning over the sternum and following the curve of the ribs over the point of fracture, and around to the opposite axilla. If several ribs are broken they are covered from above downward by similar strips overlapping.

Fracture of the Costal Cartilages.—See DISLOCATIONS.

Fractures of the Clavicle.—They are very frequent in children, being caused by a fall upon the arm which in an adult would be more likely to dislocate the shoulder. They occur usually in the middle third of the bone, are not infrequently incomplete, but very rarely compound.

Fractures of the middle third are transverse or oblique, from above downward and inward. The shoulder, losing its anterior support, drops downward, inward, and forward, the posterior border of the scapula is raised outward and its lower angle rotated slightly upward and backward. If the fracture is oblique the outer fragment slips below and behind the inner one, whose edge is prominent under the skin. Transverse fracture may give rise to angular deformity, the angle pointing upward and backward. If the fracture is comminuted the small fragments are markedly displaced; if it is bilateral the weight of the two shoulders on the chest may cause urgent dyspnoea (relieved by dorsal decubitus). Injuries to the great vessels, nerves, and lungs are rare complications. The arm can be moved forward or backward, but cannot be abducted on account of the pain rather than the muscular disability.

In fractures of the outer third the line of fracture is usually transverse and the displacement angular, with the apex backward. Disability and deformity are not great.

In fracture of the inner third the outer fragment passes below the inner one or is accompanied by it, producing angular deformity.

PROGNOSIS.—Union is almost certain to take place at the end of four weeks

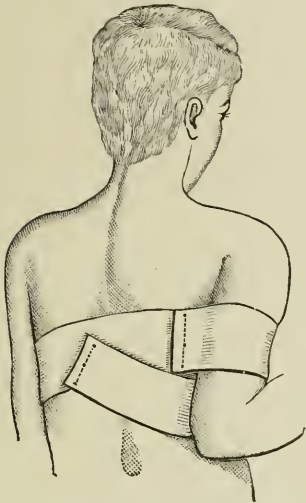


Fig. 3.—Sayre's adhesive-plaster dressing for fracture of clavicle. First piece.
(Stimson.)

whether the fracture is immobilized or not. Some persistent displacement is the rule, especially in adults.

TREATMENT.—Reduction is effected by pushing the shoulder upward, outward, and backward. Manipulation of the arm or simple dorsal decubitus will effect this. To maintain perfect reduction dorsal decubitus with the head slightly raised and the forearm resting across the chest is usually essential. In the green-stick fractures of children a simple sling may be sufficient, and the same dressing may be applied to all patients who are impatient of restraint in the more complicated dressings and are willing to accept the subsequent deformity.

In other cases Sayre's or Velpeau's

dressings will produce an æsthetically satisfactory result.

Sayre's dressing (Figs. 3 and 4) requires two strips of adhesive plaster, each three inches broad and long enough to reach one and a half times around the body. The end of one strip is fixed loosely about the arm on the injured side just below the axilla. It is then carried around the back and across the chest in such a way as to hold the elbow a little behind the axillary line. The other strap is then carried from the uninjured shoulder across the back and the point of the elbow and back to the point of starting, carrying the elbow forward, upward, and inward. Thus the shoulder is carried upward, outward, and backward. The axilla and the whole inner surface of the arm and forearm should



Fig. 4.—Same as Fig. 3. Second piece.
(Stimson.)

be well padded with cotton or wool, and the bony points of the elbow should be protected in like manner. The band had best be left uncovered and the whole dressing supported by a few turns of a roller bandage.

Velpeau's dressing, as shown in Fig. 5, holds the elbow pressed against the front of the chest. It is made with a roller



Fig. 5.—Velpeau's dressing for fracture of the clavicle. (*Stimson.*)

bandage. Padding should be applied as noted above.

Moore's ingenious combination of a

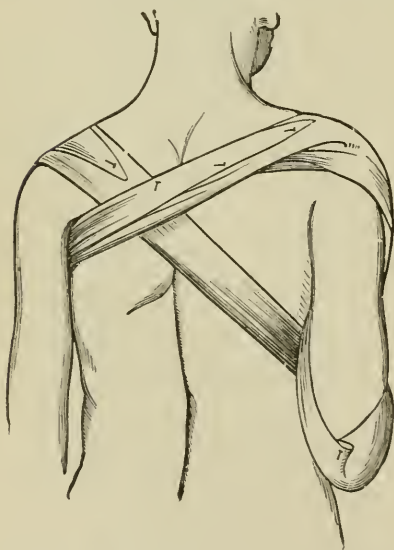


Fig. 6.—Moore's dressing for fractured clavicle. (*Stimson.*)

posterior figure-of-8 bandage to both shoulders and one elbow with a sling (Figs. 6 and 7) is effective, but uncom-

fortable, and unless carefully padded is likely to interfere with the circulation of the arms.

Fracture of the outer third is best immobilized by Stimson's dressing for dislocation of the outer end of the clavicle (*q. v.*).

To avoid deformity displaced comminuted fragments may be removed through a small incision.

Fractures of the scapula are divided into fractures of the body, of the lower

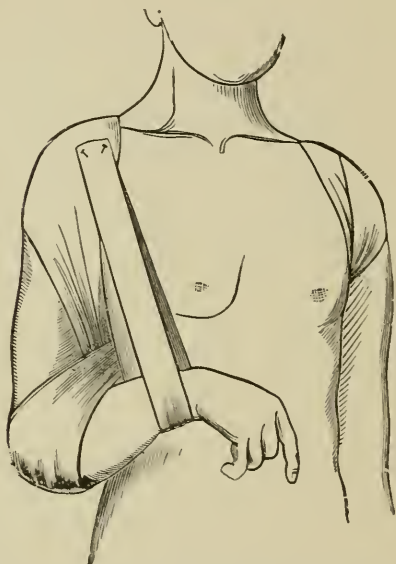


Fig. 7.—Moore's dressing for fractured clavicle. (*Stimson.*)

angle, of the spine, of the acromion, of the coracoid process, of the surgical neck, and of the glenoid fossa.

FRACTURES OF THE BODY AND INFERIOR ANGLE may be partial or complete, simple or comminuted. When the angle is torn away it is drawn forward by the attached muscles and cannot be replaced. In fractures of the body displacement is usually confined to overlapping of the fragments. The diagnosis is made in either case by palpation, and

the sole treatment is immobilization by plaster strapping, as for fractures of the ribs, and support of the arm by a sling. The only complication to be feared is suppuration in the deeper planes, which may follow even a simple fracture if the contusion has been severe.

Fracture of the acromion may be caused by external violence acting directly or through the humerus, or else by contraction of the deltoid. The fracture is usually beyond the attachment of the clavicle. Non-union of the epiphysis may occur. Bony union can rarely be obtained, but no disability follows fibrous union.

Treatment.—Velpéau's dressing (Fig. 5).

FRACTURE OF THE CORACOID PROCESS may be caused by external violence or muscular action and is often complicated by other injuries. Abnormal mobility, with or without crepitus, may be obtained by pressure on the tip of the process. Fibrous union without disability is the rule.

Treatment.—Treatment is by immobilization of the arm in slight hyperextension.

FRACTURE OF THE SURGICAL NECK.—Either the whole of the glenoid fossa or only a part of it is torn off with the long head of the triceps attached to the fragment. The support of the triceps being lost, the whole shoulder sinks downward and the displacement resembles very closely a subcoracoid dislocation. The arm, however, is not abducted nor is there any characteristic restriction of motion; a lump may be felt in the axilla, and the deformity may be reduced (with crepitus) by lifting the arm, but immediately recurs.

Treatment.—The treatment is as for dislocation of the outer end of the clavicle; bony union may be expected.

FRACTURE OF THE GLENOID FOSSA.—The rim is often broken, with dislocations of the shoulder-joint. Stellate fractures have been found post-mortem.

Fractures of the Humerus.—These may be conveniently grouped into fractures of the *upper extremity*, of the head, anatomical neck, through the tuberosities, of either tuberosity, of the surgical neck; and separation of the epiphysis, of the *shaft*, and of the *lower extremity*; supracondyloid, intracondyloid, of either condyle, or epicondyle; and separation of the epiphysis.

FRACTURE OF THE HEAD.—This is very rare, excepting the splitting that may accompany dislocation, and cannot be recognized clinically.

FRACTURES OF THE ANATOMICAL NECK AND THROUGH THE TUBEROSITIES.—These present the same clinical features and can rarely be differentiated before death; indeed, the line of fracture is likely to be so irregular as to be partly through the neck and partly through one or other tuberosity. These lower fractures are certainly more frequent than simple fractures of the anatomical neck. Most cases occur in connection with anterior dislocation. There may or may not be impaction. If the head is dislocated forward it may be felt, and its independent mobility recognized when the shaft of the bone is rotated. If the head is not dislocated, pain in upward pressure on the elbow may be the only symptom.

Treatment.—If the head is not dislocated, treatment is by immobilization with slight traction. If it is dislocated, alternatives present themselves: The surgeon may maintain the two fragments in apposition, hoping to obtain union, and then at the end of five weeks to attempt reduction by manipulation, or, this failing, by operation. On the other

hand, he may, and this seems the better plan, attempt reduction at once. If his manipulative efforts do not succeed, he may attempt operative reduction, laying bare the head, boring a hole in it, and then reducing it by means of a stout right-angled hook (McBurney) inserted into this hole. Failing in this, he may exsect the head. In any case the area should be immobilized for five weeks. The theory that the head subsequently atrophies has no very good foundation in fact. On the contrary, very good functional results are obtainable.

FRACTURES OF THE TUBEROSITIES occur in connection with dislocation of the shoulder forward (greater tuberosity) or upward (lesser tuberosity). As the fracture is often incomplete, bony union without much deformity is the usual result.

SEPARATION OF THE EPIPHYSIS may occur at any time during the first two decades of life. The most common mechanism of its production is probably hyperabduction in the efforts to pull down the arm during labor. The line of separation runs just below the tuberosities and the usual displacement is of the lower fragment more or less completely to the inner side and in front of the upper one, which is tilted outward. The edge of the lower fragment may be felt or even seem close under the skin in front. Crepitus is slight, owing to the cartilaginous nature of the edges. Reduction is by manipulation or by forced abduction, which brings the lower fragment in line with the upper one. Union may be irregular if the periosteum slips between the fragments. Immobilization must be maintained for five weeks. Persistent displacement or premature ossification of the epiphysal cartilage may arrest the growth of the limb.

FRACTURE OF THE SURGICAL NECK is by far the most common of the fract-

ures of the upper extremity of the humerus. Under this head are classed all fractures between the line of the epiphysal junctures and the insertion of the pectoralis and teres major. They are caused by direct violence or a fall upon the elbow. The displacement is usually slight, but the lower fragment may be drawn up and to the inner side of the upper one, which is then held in abduction. The diagnosis is made by eliciting abnormal mobility and crepitus when the tuberosities of the humerus are firmly grasped and the arm gently rotated. In impacted fractures there is a tender spot just below the tuberosities and the arm is usually held in slight abduction.

Treatment.—If there is much overriding, reduction can only be effected by traction in extreme abduction. If the fragments are impacted in fair position, or if there is no displacement, as is often the case, any immobilizing dressing will be sufficient. Usually, though, there is some tendency to shortening to be overcome by traction and often some abduction in the upper fragment that cannot be overcome. To meet these indications various splints have been devised. For abduction of the upper fragment the best treatment is generally to keep the patient in bed and traction by weight and pulley (see FRACTURES OF THE THIGH) on the arm held in partial abduction by being bandaged on a triangular pad or a bent metal band fitted into the axilla. After two weeks sufficiently firm union will probably have taken place for the arm to be abducted. In this position it is maintained for three or four weeks longer, by a plaster mold or circular splint of which the upper edge is molded well over the shoulder to immobilize the joint and which is made light over the forearm (the elbow being bent to a right

angle) and heavy over the arm. The whole is bound lightly to the chest and the wrist above supported by a sling, in order that the weight of the arm may tend to prevent shortening. Any shortening that may occur will be indicated by a rising of the shoulder-cap and must be compensated by weights attached to the elbow. During all this time frequent exercise of the wrist and fingers must be insisted upon.

A variation of the above line of treatment should be effective in any case. Ambulatory treatment with the arm in abduction is possible, but irksome.

A simultaneous dislocation of the head is treated as above indicated.

FRACTURES OF THE SHAFT.—These are caused by external violence or by muscular action. All varieties of fractures and displacements are seen here. The vessels or nerves may be injured, notably the musculo-spiral, which may be torn across, pressed upon by the callus, or caught between the fragments. Union is more likely to fail in this than in any other bone: a fact that has been explained by deficiency of immobilization, for, since the hand is supported by a sling, every motion of the head and neck imparts a slight movement to the fragments.

The treatment is along the same lines as that of the surgical neck. Shortening must be carefully watched for and prevented.

SUPRACONDYLAR FRACTURE.—The line of fracture passes through the lower part of the humerus, just above the condyles. The joint is usually not involved, but may be opened by an additional intercondylar fracture or fracture of the olecranon. The line of fracture is usually from behind downward and forward, and consequently the lower fragment is displaced upward and backward.

The sharp point of the upper fragment may pierce the skin in front; more rarely the fracture is compound from behind by the lower one. If the swelling is not too great the displacement can be seen as well as felt, and false motion and crepitus elicited by moving the condyles on the shaft. Dislocation is ruled out by the normal relation of the olecranon and epicondyles, as compared with the other arm, and intercondyloid fracture by the absence of its typical symptoms (*q. v.*).

Treatment.—Same as for fractures of the lower part of the shaft: immobilization with the elbow flexed at a right angle and the forearm in semipronation. A sufficient weight, usually five pounds, should be suspended at the elbow to prevent shortening, and the *hand alone* suspended in a sling. Suspension of the whole forearm gives rise to angular deformity with adduction of the forearm.

Treatment by extension may be advantageously combined with suspension of the limb in a vertical position for the first fortnight of treatment of a compound fracture; but as this position tends to tilt back the lower fragment it should never be employed except as just mentioned and then only for the advantages of elevation in the healing of the wound.

INTERCONDYLOID FRACTURE (T- or Y-FRACTURE).—This differs pathologically from a supracondylar fracture only in the additional line of fracture separating the condyles. The additional force usually required to produce such a fracture is such that the displacements are varied and likely to be marked, and the fracture is often compound and associated with injuries of the adjacent vessels and nerves. In doubtful cases the characteristic symptoms to be sought for are mobility of the condyles upon each other, usually with crepitus, and, in still

more obscure cases with no displacement, simple tenderness when the two condyles are pressed against each other.

The treatment is that of supracondylar fracture with additional care in the immobilization of the fragments. Anterior and posterior plaster splints are usually satisfactory. In compound fractures, where the joint is widely laid open, Kocher advises the removal of the external condyle to facilitate drainage and to produce a fairly strong and movable joint. In some cases it may be necessary to remove both condyles with the risk of substituting a flail joint for an ankylosed one. In all compound fractures the fragments should, of course, be retained in place by suture or temporary pegging with a nail or drill.

FRACTURE OF THE EPITROCHLEA, OR INTERNAL EPICONDYLE.—This occurs in connection with dislocation of the elbow or as the result of direct violence. The fragment is left more or less closely attached to the condyle and its mobility may be readily recognized. Paralysis and neuralgia from pressure on the ulnar nerve have been known to follow this fracture. A spontaneous cure may generally be expected.

Treatment.—Direct pressure with immobilization of the forearm in flexion to relax the attached muscles. Two or three weeks' treatment suffices.

FRACTURE OF THE EXTERNAL EPICONDYLE.—This is caused by direct violence and is extremely rare. The mobile fragment is easily recognized and immobilized.

FRACTURE OF THE INTERNAL CONDYLE.—This is caused by indirect violence through forcing upward the condyle with the ulna attached to it. The line of fracture runs from the inner side of the humerus downward and outward to the centre of the trochanter or be-

tween it and the capitellum. Ligamentous attachment to the ulna usually prevents any marked displacement, and the swelling all about the joints usually obscures such displacement as there is. The forearm is adducted, however, and abnormal adduction and abduction are possible at the elbow. (These movements can only be distinguished from rotation of the humerus when the joint is in full extension: a position but rarely obtainable except under anæsthesia.) Independent mobility of the fragment and tenderness on transcondylar pressure should be sought for. Coincident dislocation of the radius backward from the external condyle leaves that part of the humerus prominent anteriorly (see DISLOCATIONS). Unless such dislocation is present, the altered relations of the epicondyles and olecranon are likely to be distinguishable through the swelling.

The treatment is by immobilization in the usual semiflexed position. The positions of extreme flexion or extension which have been advocated are inconvenient and present no advantages. If the fragment will not remain in place, it must be cut down upon and fixed by suture. Angular deformity is liable to ensue from suspension of the elbow, as in supracondylar fracture, and may occasionally follow premature ossification of the epiphysial cartilage after fracture of the internal condyle in the adolescent. Excessive formation of callus is likely to impair the functions of the joint, especially in the young.

FRACTURE OF THE EXTERNAL CONDYLE.—The fragment consists of the external condyle, the capitellum, and part of the trochlea. The symptoms are the same, *mutatis mutandis*, as those of fracture of the internal condyle, but the disability is usually less. As more or

less rotation of the fragment is liable to occur, the most difficult part of the treatment is reduction, for which an operation may be necessary. Under such circumstances Kocher has excised the condyle, with good results. After reduction has been accomplished there is little difficulty in retaining the fragment in place, and three weeks in a posterior molded splint with the joint at midflexion suffices for a cure. Excessive callus may interfere with the function of the joint.

SEPARATION OF THE EPIPHYSIS.—This accident is very rare. The epicondyles may or may not remain attached to the upper fragments. The chief symptoms are pain on pressure of the forearm against the arm, abnormal mobility, and cartilaginous crepitus. The treatment is the same as that of supracondylar fracture.

SUBEPICONDYLAR FRACTURES.—These usually involve both trochlea and capitellum, very rarely the trochlea alone. If there is no deformity, the fracture may be trusted to heal under immobilization. But if there is persistent displacement the fragment or fragments should be excised. The fluoroscope may be of great assistance in diagnosing obscure lesions about the elbow-joint, but most cases can be diagnosed and treated without its aid.

AFTER-TREATMENT OF FRACTURES ABOUT THE ELBOW.—After the three or four weeks that are necessary to obtain union of the fracture, the elbow will be found quite stiff. If this stiffness is due solely to adhesion and capsular retraction, it may be expected to disappear after some weeks of natural use of the limb. Excessive callus, too, will diminish rapidly, and it is doubtful whether any treatment will hasten its absorption. Forcing of the joint is harmful, as a

rule, and if convalescence is too slow elastic traction to increase flexion and a weight on the hand to increase extension may hasten matters a little by supplementing the patient's own efforts. Osteotomy or arthrotomy may be resorted to after several months have elapsed; but the more conservative the treatment, the better will be the results.

Fractures of the Radius and Ulna.—**FRACTURE OF THE OLECRANON.**—This may be at the tip or near the base. The mechanism is usually indirect violence combined with the action of the triceps, the olecranon being broken across the trochlea as a stick would be across one's knee. Aponeurotic and periosteal lacerations are usually slight, and consequently there is little or no displacement. The mobility of the fragment is readily recognized.

Treatment.—If the displacement is slight, and is not increased by flexion the elbow may be immobilized midway between full extension and flexion at a right angle. In other cases the elbow must be retained in full extension, and it may even be necessary to pull the olecranon down. The simplest method of traction is by a narrow strip of adhesive plaster running up the side of the forearm over the upper border of the olecranon and down the other side. Malgaigne's patellar hooks and a figure-of-8 bandage have also been employed. An anterior molded splint gives satisfactory immobilization and permits observation of the displacement. Union is likely to be fibrous, and, in those cases in which this greatly impairs the use of the limb, the fracture may be freshened and sutured.

FRACTURE OF THE CORONOID PROCESS is extremely rare except as a complication of dislocation. As the brachialis anticus and capsule are attached to the bone be-

low the process, its displacement is slight and it unites kindly under immobilization at a right angle (to prevent recurrence of the dislocation).

FRACTURE OF THE HEAD AND NECK OF THE RADIUS is usually associated with the last-mentioned lesion as a complication of backward dislocation of the elbow. If the fracture can be clearly made out the fragments should be removed, for they are likely by their malunion to interfere with supination; but if the diagnosis is not certain the operation may safely be postponed until it is demanded by impairment of function. Only one case is reported of fracture of the neck of the radius alone.

FRACTURES OF THE SHAFT OF ONE OR BOTH BONES.—Fracture is usually in the middle or lower third of the forearm, and the radius is usually fractured at a higher level than the ulna. Fracture of a single bone is most frequently due to direct fracture of both bones to indirect violence. Green-stick fractures are more common in the radius than in any other bone. Displacement in any direction may occur, and, if unreduced, is of special importance as affecting the rotation of the forearm. A peculiar displacement is that of supination of the upper fragment of the radius by the biceps when the bone is broken above the insertion of the pronator teres. According to most authors, unless the limb, in such case, is immobilized in extreme supination a permanent loss of that motion will result. Practically, however, the impairment to supination when the limb is kept in the usual semipronated position is unimportant. Of far greater importance is the total loss of rotation that follows fusion of the two bones even when a lateral enarthrosis appears in the callus, as is rarely the case. The points that favor such a fusion are: (1)

persistent displacement of the bones toward each other, (2) excessive callus from insufficient immobilization or imperfect reduction, and (3) the rare occurrence of fracture in both the bones at the same level.

In fractures of a single bone the displacement is usually slight, and the diagnosis may be difficult. A point of local tenderness may be found with either crepitus, false motion, or irregularity of the surface of the bone. In fractures of the ulna alone the head of the radius is often dislocated forward and upward.

TREATMENT.—Reduction by traction and local pressure, special attention being paid to the correction of any displacement of the bones toward each other, forcing them apart by deep pressure with the finger-tips on the front and back of the forearm. Green-stick fractures must be reduced by forcible bending, even completing the fracture, if necessary. *Circular constriction* of the limb should *never* be applied, for this is a most fruitful source of gangrene. The best splint is made of two well-padded boards a little broader than the forearm, the anterior one to extend from the elbow to the roots of the fingers (a roller bandage in the palm will prove grateful) and the posterior one from elbow to wrist. These are retained snugly by adhesive plaster strips, thus forcing the muscles between the bones. Angular deformity is avoided by slinging, not the forearm alone, not the hand alone, but both, comfortably and in the same palm. Such a sling also immobilizes the elbow: an essential to the treatment. Pressure of the anterior splint on the brachial artery at the elbow and pressure on the bony points must be avoided. At the end of two or three weeks a plaster splint may be substituted for the

wooden one, and in any case daily exercise of the fingers must be insisted on after the tenth day. Firm union should occur in a month, but delayed union is quite frequent.

FRACTURE OF THE LOWER END OF THE RADIUS (COLLE'S FRACTURE).—This is, after fracture of the ribs, the commonest of all fractures. It is generally produced by a fall upon the palm of the hand. The line of fracture runs irregularly across the bone within an inch of its articular edge. In the young it commonly follows the epiphysial line. The lower fragment is tilted back and impacted. It may be comminuted. The upward displacement is not great, but the tilting and crushing carry the styloid process of the radius to a higher level than that of the ulna, which is made prominent by the shifting over of the carpus. The periosteum on the back of the radius remains untorn. The styloid process or shaft of the ulna may be broken. Rarely the internal lateral ligament is torn.

The characteristic symptoms are the so-called "silver-fork" deformity, a backward displacement of the whole hand and the lower end of the radius, producing a swelling over the back of the wrist and a deep crease in the front. The styloid process of the ulna is prominent and lower than that of the radius. Crepitus and mobility are usually absent. There is a line of tenderness along the line of fracture.

The diagnosis from dislocation is given under that heading.

Treatment.—The simplest way to break up the impaction is for the surgeon to grasp the forearm firmly just above the fracture. With the other hand he then grasps the injured hand, placing his thumb lightly on the back of the lower fragment. Dorsal flexion is made

until the patient complains of pain, and then with a sudden movement the dorsal flexion is increased and simultaneously strong pressure is made on the lower fragment. In a moment the fracture begins to give, the dorsal is quickly exchanged for palmar flexion, the wrist being pried backward, and the resultant crepitus announces the dissolution of the impaction. Inspection should then show that the "silver-fork" deformity has disappeared. The impaction once thoroughly broken up, the bones tend to remain reduced, and should be immobilized by anterior and posterior wooden splints, which need not extend so far up the forearm as for fractures of the shaft (*q. v.*). Massage is very useful to shorten the convalescence and can best be used if, instead of wooden splints, molded plaster ones are used, extending from the middle of the forearm to the metacarpophalangeal joint both in front and behind. The hand is most comfortable in slight dorsal flexion. Its position bears no particular reference to that of the fragments. A simple band of adhesive plaster around the wrist is said to decrease the prominence of the ulna, and, indeed, seems to be the only splint necessary in some few cases. The fingers must be exercised after the tenth day.

OTHER FRACTURES NEAR THE WRIST.—Cases have been recorded of reversed Colles's fracture from a fall on the back of the hand. The lower end, or styloid process, of the ulna may be fractured alone. The so-called Barton fracture of the anterior or posterior lip of the articular surface of the radius is merely incident to dislocation of the carpus (*q. v.*).

Fractures of the carpus are very rare and usually compound.

METACARPAL FRACTURES usually occur in the third and fourth bone and are caused by direct or indirect violence.

The injury is readily recognized. The tendency to displacement is slight. A favorite splint is made by fastening the hand over a soft ball by means of a strip of adhesive plaster. An anterior splint well padded up in the palm serves equally well.

Phalangeal fractures are usually compound. The hand may be bound over a roller bandage by means of several strips of adhesive plaster, one for each finger. Straight posterior splints may also be used.

Fractures of the pelvis may be grouped under seven heads:—

FRACTURES OF THE RING.—Under this title are grouped all fractures that dissolve the continuity of the pelvic ring. Such fractures must, of necessity, be vertical in the main. They are usually caused by a crushing from before backward. The line of fracture usually runs through the upper (just internal to the pectineal eminence) and lower (near its junction to the ischium) rami of the pubic bone. Such a fracture may be bilateral, and associated with a vertical fracture of the sacrum, a separation of the sacro-iliac synchondrosis, or a fracture through the ilium behind the acetabulum. These are the double vertical fractures of the pelvis. This double fracture may also occur from a fall on the foot, or the same cause may dislocate the os innominatum at both symphyses. Or it may cause a radiating fracture of the acetabulum with or without penetration of the femoral head through the bone. Fractures of the ring are usually comminuted. Displacement of small fragments or a general mobility, with crepitus, of the whole pelvis may often be recognized. In double vertical fracture the fractured bone is often tilted; so that the superior strait is widened, the inferior strait narrowed, and the limb

apparently shortened. Complications are usual and severe. Rupture of the membranous or prostatic urethra is almost inevitable, and the other common injuries are rupture of the pelvic vessels, the rectum, the bladder, and the ureters.

Treatment.—The associated injuries demand immediate attention. For the fracture itself rest in bed with even compression all around the pelvis is all that can be done, except in cases of tilting of the os innominatum, in which traction should be made as after fracture of the thigh.

TRANSVERSE FRACTURE OF THE SACRUM results from direct violence. The angular displacement forward may be corrected by pressure from within the bowel. A tendency to recurrence has been prevented by the adaptation of the urethral striated cannula to the rectum.

COCYGEAL FRACTURE resembles dislocation. It is rarely observed.

FRACTURES OF THE ILIUM are comparatively frequent and the result of direct violence. The crest of the various spinous processes may be broken. The treatment is rest in bed.

FRACTURES OF THE ISCHIUM in any of its parts is rare, as is

FRACTURE OF THE PUBES not extending across both rami.

FRACTURE OF THE ACETABULUM.—Fracture of the rim may complicate dislocation of the hip and may be so extensive as to favor recurrence. Stellate fracture may be indicated by pain on pressure through the thigh. If the head of the femur has perforated the acetabulum it should be replaced by traction.

Fractures of the Femur.

FRACTURE OF THE NECK OF THE FEMUR.—The division of these fractures into intracapsular and extracapsular has no clinical value and is not borne out by post-mortem findings. The more accu-

rate classification is: (1) fractures through the (narrow part of the) neck, and (2) fractures at the base of the neck. Clinically, it is often impossible and never necessary to distinguish between the two.

Symptoms.—The chief deformity is shortening of the limb with eversion. The eversion is usually slight, often absent, and rarely exchanged for inversion. The shortening may appear at once or may only come on gradually. In the latter case, under appropriate treatment the shortening may never appear at all. In measuring for shortening the greatest care must be taken to compare the limbs when placed in exactly similar positions. There is also a fullness in the outer part of Scarpa's triangle, and the fascia lata above the great trochanter is relaxed, as compared with the other side, on account of the elevation of the trochanter. Normally the upper border of the great trochanter just touches Nélaton's line drawn from the anterior superior spine of the ilium to the tuberosity of the ischium (*A-B*, Fig. 8). In fracture of the neck, with shortening, the trochanter rises above this line, and the amount of displacement may be measured by means of Bryant's ilio-femoral triangle, variations in the length of the line *C-D* (which is at right angles to *A-C*, a perpendicular dropped from the anterior superior spine of the ilium) indicating the displacement of the trochanter. If the trochanter is split, it is broadened in comparison with its fellow.

Crepitus can rarely be obtained. Pain may be diffuse, but pressure over the neck of the femur is likely to be painful, as is upward pressure of the femur. A few cases are reported in which the patient has walked on the limb, but usually loss of function is complete and all the movements of the joint restricted.

The history of a typical case is as fol-

lows: An elderly person, preferably a woman, while walking about, stumbles and falls to the floor, with perhaps little violence. She cannot rise, and complains that every movement of the hip is painful. Examination will reveal symptoms as indicated above.

Diagnosis.—The diagnosis between the fractures through the neck and those at the base is often impossible. Splitting of the trochanter is a sure sign of the latter, while after the former it is believed that shortening is more likely to be secondary.

In dislocation the motions of the limb are restricted in certain definite directions and the head can be felt while in the usual dorsal dislocation; the empti-

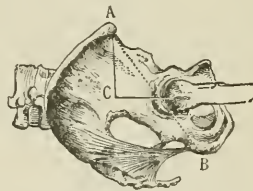


Fig. 8.—*A-C-D*, Bryant ilio-femoral triangle. *A-B*, Nélaton's line. (Owen, "American Text-book of Surgery.")

ness of the acetabulum may be determined by pressure on Scarpa's triangle.

In subtrochanteric fractures the trochanter does not share in gentle rotation imparted to the shaft.

In old persons it is not rarely an absolute impossibility to differentiate contusion of the hip from fracture of the neck of the femur. In such a case, when the sole symptoms are pain and disability, treatment for fracture should be instituted without the slightest hesitation, the patient being bedridden in any event, and this treatment should be continued for at least three weeks and until all pain and soreness have disappeared. Thus, if it turns out to be a contused hip, the

patient has not been unduly inconvenienced, while if it be a fracture, he has been given the best chances of recovery and the surgeon has, perhaps, avoided a suit for malpractice.

Etiology.—As has already been indi-

Prognosis.—The prognosis, even as regards life, is far from cheering. The aged and feeble patient is liable to pass into a cachectic or demented state and thus to fade away, often with hypostatic pneumonia.



Fig. 9.—Adhesive plaster cut for Buck's extension. (Stimson.)

cated, fractures of the neck of the femur is usually caused by a comparatively slight injury to an old person, usually a woman. In the young a much greater amount of violence is required to break the bone.

Or he may die in a few days by the shock. After he has passed the third week, however, the prognosis is good.

As to union, it may be fibrous or fail entirely, such a result entailing in some cases no disability to speak of beyond the



Fig. 10.—Adhesive plaster folded for Buck's extension. (Stimson.)

Pathology.—In fractures through the neck the cancellous tissue is crushed, but impaction is rare. The head of the bone may be splintered. As a portion of the periosteum habitually remains untorn, the vitality of the head is insured

inconvenience of a shortened limb, while in others locomotion may be entirely lost.

Treatment.—The first indication is to save the patient's life, and to this all else must be subordinate. Such splints

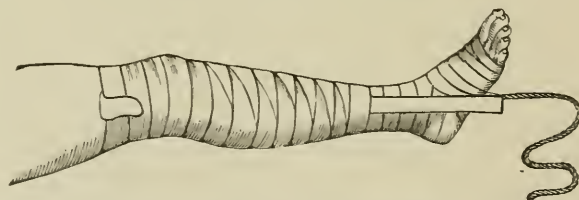


Fig. 11.—Adhesive plaster applied for extension. (Stimson.)

thereby, and union, fibrous at least, may be expected. Fractures at the base are likely to be impacted and the line of fracture may split the great trochanter. The greatest impaction is usually behind; hence the thigh tends to rotate outward. The callus is often excessive.

should be applied as will most promote the patient's comfort, and the disturbance of repeated measurement and redressing avoided. Careful nursing, feeding, and stimulating are of capital importance. Premonitory signs of dementia must be watched for, and if the pa-

tient seems to be failing he must be gotten out of bed, whether his thigh has united or not. In this event the hip should be disturbed as little as possible and the patient allowed to recline in a wheel-chair. Pressure over the trochanter will encourage union, the pressure to be made by a pad under a pelvic band worn as tight as is compatible with the patient's comfort.

Energetic manipulations either for the purpose of eliciting crepitus or cor-

but Hodgen's is more convenient for the patient, and should be preferred for the aged.

In Buck's extension the traction is made by weight and pulley over the foot of the bed, which may be raised for counter-extension. It is applied as follows: A strip of stout adhesive plaster (the so-called "moleskin-diachylon" plaster, although it is rather difficult to apply, requiring to be heated before it will adhere, —and if overheated it will blister the

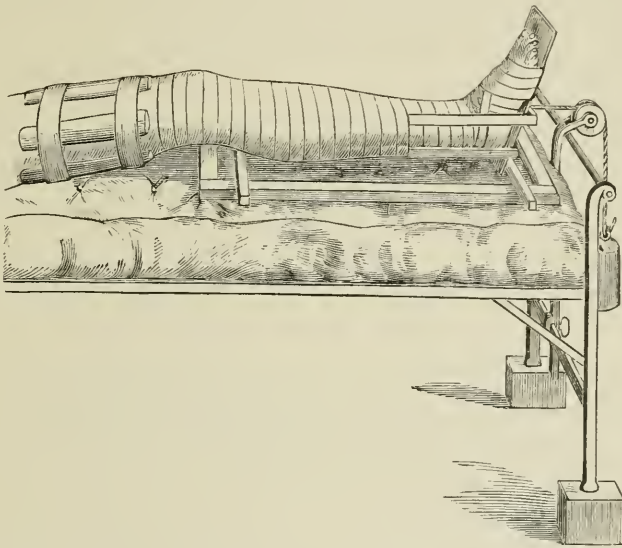


Fig. 12.—Volkmann's sliding rest for fracture of the thigh. (*American Text-book of Surgery.*)

recting deformity have a tendency to tear the periosteum still farther and to separate impacted fragments. Such shortening or eversion as cannot be overcome by the traction splint is best left uncorrected, lest non-union be courted. Traction should be continued for at least five weeks and the patient kept in bed a week longer. The best traction-splints are Buck's and Hodgen's. Buck's is the more convenient for the surgeon, permitting accurate examination and measurement without disturbing the dressing;

skin,—is least irritating), four inches wide and long enough to reach from well above the knee loosely around the sole of the foot and back above the knee again, is cut as shown in Fig. 9, and a small perforated block of wood placed at its centre. Through the hole in the wood and a corresponding one in the plaster a cord is passed, so knotted at the end that it cannot slip through. The edges of the plaster are now turned down over the block and each other (Fig. 10). A roller bandage (preferably of flannel) is applied

to the foot and lower third of the leg, the adhesive plaster applied to the sides of the leg and thigh above it, and the bandage continued up over the plaster (Fig. 11). The cord is then carried over the pulley at the foot of the bed and attached to a weight of from 5 to 20 pounds, the heavier weights only being applied to robust and young patients whose shortening is not done away with by the lighter ones. Outward rotation is prevented by employing Volkmann's sliding

under the limb, and pinned to the other in such a way as to give uniform support to the limb when it is raised from the bed. The apparatus is supported by two loops tied to a cord which is attached to a crane at a point at least four feet above the bed and at an angle of about ten degrees from the vertical.

Traction hip-splints, such as are used in hip-joint disease, have also been applied here. Their use is certainly a great convenience and will doubtless be more

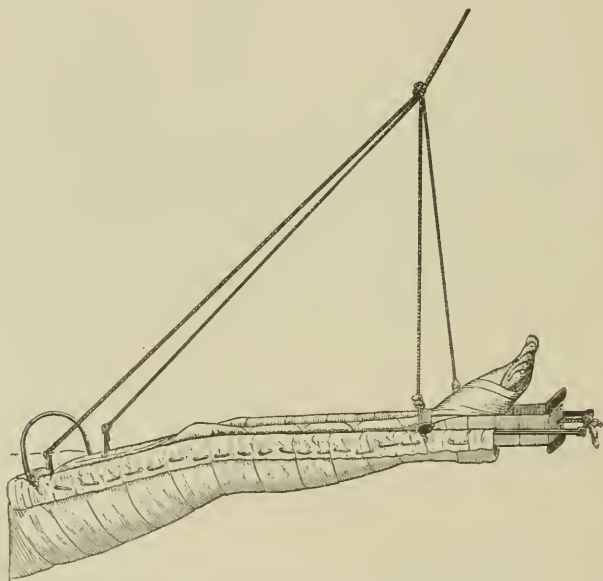


Fig. 13.—Hodgen's splint. (*American Text-book of Surgery.*)

rest (Fig. 12), and sand-bags along the outer side of the thigh.

Hodgen's splint (Fig. 13) consists of two iron rods slightly bent at the connection of their upper and middle thirds and attached together by a straight bar at the lower ends and a curved one at the upper. The limb being attired as for Buck's extension (Fig. 11) the cord is attached to the straight cross-bar and a number of narrow compresses or pieces of bandage are pinned to one rod, passed

frequent in future. Unfortunately, however, they cannot be used by the very ones who need them most—the aged and infirm.

When the shortening has once been reduced some surgeons prefer to apply a plaster splint from waist to ankle at once. With such a splint pressure may be made over the trochanter through a fenestra to encourage union.

Excision of the head for non-union has been done with varying success, but

should not be attempted until the failure of a prolonged course of treatment by ambulatory traction, combined with firm pressure over the trochanter (Schaefer), has shown that union is impossible.

FRACTURES OF THE GREAT TROCHANTER.—The trochanter alone may be separated by direct violence, or the line of fracture may pass through the neck above the lesser trochanter and thence through the lower part of the great trochanter. In such cases there are the usual signs of fracture of the neck, to which are added independent mobility of the trochanter and a prominent tender spot in front of it.

Treatment.—Hodgen's splint.

FRACTURE OF THE SHAFT.—Under this head may be included both "subtrochanteric" and "supracondylar" fractures. The line of fracture is usually oblique and there is both overriding and angular deformity. As the line of fracture usually runs downward and forward the angle is made by the posterior fragments being drawn up behind it. The upper fragment is often rotated outward. In fractures of the upper third the upper fragment is usually abducted. In those of the lower third its sharp point is liable to pierce the quadriceps and even the skin. The shortening may be determined by measurement, the abnormal mobility by gently elevating the limb beneath the point of fracture. The trochanter is not displaced upward. A complicating synovitis of the knee is common, laceration of the great vessels rare.

Prognosis.—Shortening of about an inch should be expected.

Treatment.—Reduction is to be made gently. In fractures of the lower third if the upper fragment has pierced the quadriceps and cannot be disengaged by traction with the knee and hip strongly

flexed, reduction must be made through a free incision.

Immobilization is best made by Hodgen's splint, which, while it does not immobilize quite as fully as Buck's, permits much more liberty to the patient, and can be adjusted in such a position as to avoid deformity more surely, namely: flexion and abduction of the hip for high fractures and flexion of the knee for low ones. With Buck's extension it is particularly essential that the bed should be made flat by a "fracture-board" placed under the mattress. If the fracture is near the centre of the shaft coaptation splints may be used with advantage. In England a long side-splint with traction is a favorite dressing. It is very inconvenient. The tendency to outward rotation in the upper fragment is best opposed by a hard cushion under the great trochanter. Traction should be maintained for six weeks, the patient being kept under constant observation. Then he should be kept on crutches with a plaster-of-Paris splint from waist to ankle for about three weeks longer. If union is fibrous the irritation of walking in a plaster splint should be beneficial, but great care must be taken to avoid angular deformity.

Ambulatory treatment as for fractures of the neck of the femur has proved satisfactory. Children under 10 are best treated by vertical suspension of both legs. The pelvis should rest lightly on the bed, thus making counter-extension.

For compound fractures the double-inclined plane (Fig. 14) is often most convenient. It affords no traction, but the loss of bone-substance by comminution usually renders traction unnecessary. In other cases Smith's anterior splint, which acts like a suspended double-inclined plane, is more appropriate.

FRACTURES OF THE LOWER END OF THE FEMUR.—Epiphysiolysis is more frequent here than at any other point. It occurs as late as the twentieth year, usually from torsion or hyperextension of the leg. Associated injury to the vessels is common. The treatment is the same as for fractures of the shaft.

Fracture of one condyle is usually due to direct violence. Immobilization should be made with the knee extended.

Intercondyloid fracture presents the same features as intercondyloid fracture of the humerus.

TREATMENT.—Any fracture of the femur involving the knee-joint should be immobilized in extension. A molded posterior splint and slight traction will

readily palpable, but is usually small at first, for the lateral ligamentous attachments of the upper fragment prevent the quadriceps from drawing it up the thigh. The joint becomes distended with effused blood. The periosteum over the patella is torn irregularly and a fringe of it drops between the fragments.

PROGNOSIS.—In the absence of treatment or from its inefficient application the two fragments will be drawn farther apart by the retraction of both the ligamentum patellæ and the quadriceps. Adhesions from organized blood-clot and lacerated ligaments immobilize the joint more or less completely, and extension is still farther impaired by adhesions between the upper fragment and the femur

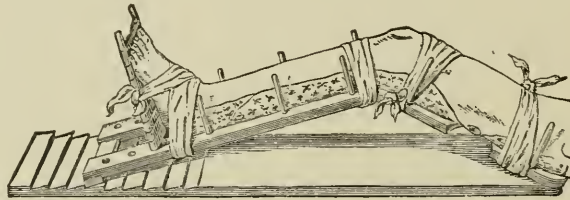


Fig. 14.—Esmarch's double-inclined plane. (*Esmarch and Kowatzig.*)

usually prove satisfactory as far as the fracture is concerned; but the chief dangers are gangrene from injury to the popliteal vessels, and ankylosis or suppuration in the knee-joint. Some subsequent stiffness in the knee is always to be anticipated.

Fracture of the Patella.—This is common between the ages of 20 and 50. It may be comminuted when due to direct violence. Rarely it is vertical. Ordinarily it is transverse and due to muscular action, as in jumping or avoiding a fall. The sudden pull of the quadriceps snaps the bone. The snap and a sharp pain are felt by the patient, and extension of the leg is almost completely lost. The gap between the fragments is

and by the loss of coaptation between the patella and the condyles.

TREATMENT.—Non-operative treatment consists in causing the absorption of the fluid in the joint by pressure (massage is of little service) and then immobilizing the fragments until union has taken place. A Martin bandage should be applied with as much pressure as the patient can bear for four to six days, and may be continued for a fortnight if it holds the fragments in good position. During this time the patient is kept in bed with the knee extended. A posterior molded splint is then applied from the ankle to near the hip and is bandaged in place as shown in Fig. 15, the turns of the bandage about the knee

pressing the tissues above and below the fragments toward each other,—these may be reinforced by strips of adhesive plaster,—and finally a few turns are taken over the fracture to prevent tilting forward of the fragments. The dressing must be worn for a month and frequently inspected and altered if necessary. At the end of this time an immobilizing plaster bandage is applied, and the patient allowed to go about on crutches. This splint must be worn for a month, not that union will become much firmer, but so as to accustom the patient to walking about, and to loosen the adhesions a little, that the bone may

fragments in apposition by means of sharp hooks, which may be inserted into the upper and lower edges of the bone and drawn together by a screw. The danger in their use is that suppuration provoked at the points of puncture may travel into the joint either through the lymphatics or the cellular plains, especially if there is much effusion of blood. Finally, aspiration has been used—with strictest asepsis—to empty the joint more rapidly than is possible by pressure.

Operative measures include various sutures,—mediate, immediate, subcutaneous,—the trimming off of the fringe interposed between the fragments, and

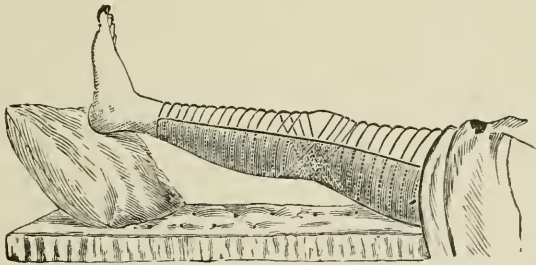


Fig. 15.—Hamilton's dressing for fracture of the patella. The final turns of the roller in front of the knee are not shown in cut. (*American Text-book of Surgery.*)

not be refractured by another fall or slip. During this time massage may prove useful, and to that end the splint may be split anteriorly, removed daily, the limb massaged, and the splint replaced and held firmly by a roller bandage. At the end of the second month the patient is discharged, but advised to walk with care. Various splints have been devised to secure immobilization of the knee and coaptation of the fragments, but they present no advantages over the above method. A plaster bandage should never be applied until union has taken place. Malgaigne's hooks and their various modifications have had great vogue. The principle involved is the holding of the

washing out the joint. The following operation is preferred,—if operative treatment is elected: Through a median incision extending a little above and below the fragments, sharp hooks are inserted into each fragment, drawing them apart, and the joint is flushed with sterile "normal" salt. The whole line of fracture is now exposed by lateral retraction of the flaps, and, *without touching the tissues with his fingers*, the surgeon elevates any interposed fascia and periosteum and holds them and the fragments in place with a few fine catgut sutures. A suture or two may also be taken in the capsule of the joint, if it is widely torn. These sutures may be reinforced

by a single silk or stout catgut suture passed through the quadriceps tendon and the ligamentum patellæ and crossing the front of the bone. The skin is then sutured with silk. No drainage. A plaster bandage is applied and the patient sent to bed, where he remains with his foot elevated for a week. The splint is then removed, the skin sutures taken out, and the splint reapplied. A few days later the patient gets up on crutches. These and the splints he wears for a month. The splint is then cut down again, and he wears it in the day-time alone for another month. No further treatment is required. The operation may be done under cocaine. The reasons for preferring this operation to any other is that it fulfills the indications of washing out the joint, complete reduction, and firm immobilization in a thoroughly aseptic manner, and leaves behind no foreign body in the joint to set up suppuration or irritation. By keeping his hands from contact with the tissues the surgeon makes the operation as safe as, and safer than, any subcutaneous one, as has been borne out by the experience of ninety consecutive cases without suppuration (Stimson).

The Choice of Treatment.—The results of immobilization vary from a perfect functional result with about one-fourth inch separation to absolute loss of function with wide separation or stiffness in the joint. Such results are attained within about six months. Operation may give a perfect result with linear union, but, on the other hand, post-operative suppuration in the knee-joint may prove fatal. If the operation is successful the patient saves about two months of convalescence and a great many of the doubts and annoyances incident to mechanical treatment. Therefore the operation is to be preferred, if the risks of

suppuration can be absolutely eliminated. Such is the case only when the surgeon is sure of his own cleanliness, as well as that of his assistants and instruments, is conversant with operative and aseptic technique, and is sure to keep his hands out of the wound. Under such conditions operation is to be elected, with the patient's concurrence.

If function is impaired by failure of union, operation is the only resource. For lengthening the contracted quadriceps its tendon may be nicked at the more tense places, and its lower fibres may be elevated from the femur. Care must be taken, however, not to impair the vitality of the tendon and the fragment of the patella attached to it.

Fractures of the Leg.—UPPER END.—Both bones may be fractured, or else the tibia alone. The avulsion of the spine of the tibia by the crucial ligaments is merely a complication of dislocation. A few cases of epiphysiolysis and longitudinal fracture of the tibia have been noted. If the line of fracture runs into the joint its functions may be impaired, and a tendency to displacement with a resultant genu varum or valgum must be foreseen and prevented by immobilization. Permanent traction may be necessary when there is much comminution.

Avulsion of the tubercle of the tibia is caused by muscular action quite as is fracture of the patella. Recovery of function may be expected if the leg is immobilized in extension on the posterior molded splint and the fragment retained in place by adhesive plaster.

SHAFT.—The usual seat of fracture is at the junction of the middle and lower thirds, the fibula being fractured higher than the tibia. The tibia lies so near the surface of the limb that a diagnosis of its fractures is usually to be made by palpa-

tion. This subcutaneous situation also serves to make compound fractures frequent. If the tibia is fractured an accurate diagnosis of fracture of the fibula, often very difficult without the aid of the fluoroscope, need not be made. Fracture of the fibula alone may be made out by a localized point of tenderness elicited by direct pressure or pressure elsewhere along the shaft of the bone.

(Edema and neuralgia are exceptionally likely to complicate convalescence from fractures of this region.

Treatment.—Reduction is accomplished by traction with the knee flexed to relax the gastrocnemius. A simple method of treatment is to keep the limb in a Volkmann splint for a few days until the primary swelling has disappeared, when a plaster bandage is applied from the toes to the knee, and changed every ten days until union takes place,—the sixth week. If bony union is delayed, the irritation of bearing some weight on the limb in its plaster incasement may prove beneficial. From the time of the application of the plaster splint the patient gets about on crutches. If it is wished to have him about from the first the Volkmann splint may be replaced by a twin posterior molded splint, the two halves of which, when they reach the ankle, diverge to cross each other on the dorsum of the foot.

The subject of ambulatory treatment has already been dealt with in the chapter on general treatment.

Compound fractures are best dressed through a Volkmann or fenestrated plaster splint.

LOWER END.—Fracture of the shafts of both bones low down and irregular comminuted fractures require immobilization with the foot at right angle to the leg. Primary amputation is indicated for badly-communited compound frac-

tures. The common fractures here are fractures by eversion and abduction (Potts) and fractures by inversion (external malleolus and rarely the internal one).

POTT'S FRACTURE.—This is the commonest fracture of this region. It is caused by eversion and abduction of the foot. The outward and backward displacement of the foot is typical (Figs. 16 and 17). Lateral mobility in the ankle-joint, combined with points of tenderness over the internal malleolus, over the lumen, tibio-fibular articulation in front and over the fibula above the malleolus



Fig. 16.—Pott's fracture, showing outward displacement. (*American Text-book of Surgery.*)

are pathognomonic signs of this fracture. These tender points lie over the then typical lines of fracture, as shown diagrammatically in Fig. 18. The posterior portion of the articular surface of the tibia may also be crushed. Rupture of the deltoid and tibio-fibular ligaments may replace the tibial fractures. The typical deformity is caused by the loss of the normal support to the inner side of the foot, and tibio-fibular diastasis, which allows the astragalus to slip backward, sometimes so far that it may be quite behind the tibia. If the displacement is not great the patient can walk, though

painfully. The fracture of the internal malleolus may be compound.

Treatment.—To effect reduction the foot must be forced forward and inward, and immobilized in inversion. To maintain reduction posterior and external plaster-of-Paris splints are very service-

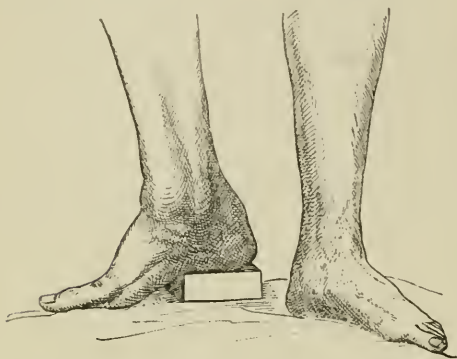


Fig. 17.—Pott's fracture, showing also backward displacement. (*American Text-book of Surgery.*)

able, the former to extend from the upper third of the leg to the toes, the latter from the same level down to and around the foot, ending at the outer side of the dorsum, the so-called "stirrup-splint." In uncomplicated cases the patient may be allowed to get about on crutches as soon as the primary swelling has abated—a new splint being then necessary—and after that need only be seen often enough to forestall any recurrence of the deformity. It is in Pott's fracture that ambulatory splints are most likely to be of practical use. Some patients can walk with only the support of a shoe, for, as we have seen, the deformity is angular, outward, and backward, and as long as this angular deformity is prevented the functions of the limb are but little impaired. A plaster incaseement fortified on the outer side and behind may meet the indications very satisfactorily. It should extend from the toes almost to the knee and be firm and heavy.

If the fragment of the internal malleolus cannot be reduced the knife must be resorted to.

While the results that follow careful treatment are perfectly satisfactory, old unreduced fractures are very troublesome. They may be improved and sometimes cured by supramalleolar osteotomy, or better still by opening both sides of the joint, chiseling through the old lines of fracture, removing obstructing callus, and reducing the fracture as though it were a recent one.

FRACTURE OF THE EXTERNAL MALLEOLUS.—This occurs by the opposite force from that which produces Pott's fracture, namely: inversion of the foot. If, as is usually the case, the fibula alone is broken, or the fibula and the tip of the internal malleolus are broken, it is sufficient to immobilize the foot while it is pressed well inward to prevent widening of the mortise. But if the lower end of the tibia is broken obliquely across, as sometimes occurs, special attention



Fig. 18.—Usual three lines of fracture in Pott's fracture at ankle. (*Stimson.*)

should be paid to the backward displacement.

Fractures of the Foot.

FRACTURE OF THE ASTRAGALUS.—This is usually associated with fracture of the os calcis, being caused by a fall on the foot. If there is no displacement the

sciagraph is required for diagnosis, and the only treatment is immobilization of the foot. If, however, a fragment is displaced and cannot be reduced, or if the bone is crushed, the fragments had best all be removed, a complete excision of the bone giving a very satisfactory result.

FRACTURE OF THE CALCANEUM.—This may occur from direct violence, from strain on the plantar ligaments, and from forcible action of the muscles of the calf, putting the tendo Achillis on the stretch. Three weeks are required for solid union. If the fracture separates the sustentaculum tali, the limb must be immobilized with both knee and ankle flexed.

METATARSAL FRACTURES.—Rest, elevation, and massage will suffice for the cure of single fractures. Multiple fractures require a splint.

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FRIEDREICH'S DISEASE. See PARALYSES.

FROST-BITE. See PERNIO.

FURUNCULOSIS. See ABSCESS.

G

GALLOPING CONSUMPTION. See PHTHISIS.

GALL-STONES. See CALCULI, BILIARY.

GANGRENE. See VASCULAR DISEASES.

GASSERIAN GANGLION. See TIC DOULOUREUX.

GASTRALGIA. See STOMACH, DISORDERS OF.

GASTRIC CATARRH, ACUTE. See STOMACH, DISORDERS OF.

GASTRIC CATARRH, CHRONIC. See STOMACH, DISORDERS OF.

GASTRIC FISTULA. See STOMACH, DISORDERS OF.

GASTRIC ULCER. See STOMACH, DISORDERS OF.

GASTRITIS. See STOMACH, DISORDERS OF.

GASTRODYNIA. See STOMACH, DISORDERS OF.

GASTROPTOSIS. See STOMACH, DISORDERS OF.

GAULTHERIA.—The *Gaultheria procumbens*, or winter-green, is a small, shrub-like evergreen plant, bearing a small, red berry (called teaberry, checkerberry, partridge-berry, boxberry, or deerberry) which is edible. It is indigenous to the woods of the United States, from the extreme north down to the Carolinas. The leaves alone are used for the two preparations which are official in the U. S. P. By distillation of the leaves a volatile oil (*oleum gaultheria*, U. S. P.) is obtained. This oil is of a light-straw color, which becomes darker on exposure to the air. It possesses a peculiar penetrating odor, a sweetish, pungent, aromatic taste, and a slight acid reaction. It

contains a hydrocarbon (gaultherilen) and an acid (methsalicylic acid); consists almost entirely of pure methyl-salicylate (99 per cent., according to Merek). It is soluble in alcohol, ether, chloroform, and carbon disulphide. Besides having medicinal virtues, it is often used as a flavoring substance to render mixtures more palatable.

Preparations and Dose.—Oleum gaultheriæ, 5 to 30 minims.

Spiritus gaultheriæ, 5 to 30 minims.

Physiological Action.—The physiological action of gaultheria is almost identical with that of salicylic acid; in small doses it is a stimulant and carminative. In larger doses it is an antiseptic, antipyretic, antirheumatic, and analgesic. Hare and Wood have shown that in therapeutic doses the oil is entirely decomposed in the system, although in tonic doses it may escape in part unchanged by the urine.

Poisoning by Gaultheria.—In slightly tonic doses there is produced a marked tinnitus aurium, nausea, vomiting, and rapid pulse. One ounce of the oil has proved fatal. In this case the principal symptoms were profuse diaphoresis, pain in the head and abdomen, purging; frequent, painful, and at last involuntary micturition; with convulsions, tonic spasms, dilated pupils, lessened arterial pressure, abolition of sight and hearing, rapid respiration, depression of the heart's action, and finally death by respiratory failure in fifteen hours.

Ten to 20 minims of the oil every 3 to 4 hours found to produce a marked ringing in the ears and subsidence of pain in 24 to 48 hours. In one instance of very painful muscular rheumatism $\frac{1}{2}$ drachm given every 2 hours, and 5 to 6 doses taken before the stomach rebelled. Excessive cinchonism was produced, with nausea and rapid pulse, but the pain disappeared. Dercum (Jour. of Nervous and Mental Dis., Jan., '88).

Treatment of Poisoning by Gaultheria.

—The stomach should be evacuated by means of an hypodermic injection of apomorphine ($\frac{1}{10}$ to $\frac{1}{6}$ grain), or if conscious by any available emetic. Cardiac and respiratory stimulants (ether, caffeine, strychnine) are then indicated, using artificial respiration, and convulsions or spasms by the hypodermic administration of morphine.

Therapeutics.—The therapeutic uses of gaultheria are similar to those of salicylic acid. The oil utilized is principally in the treatment of acute articular rheumatism in doses of 5 to 30 minims, in capsules, in emulsion, or dropped on sugar, three or more times daily, as the case may require. Lint saturated with oil, wrapped around the part affected, and covered with a piece of thin rubber cloth or rubber tissue to prevent evaporation, may be used, as suggested by Lannois and Limousin, in cases of acute and chronic rheumatic joints.

Literature of '96-'97-'98.

Attention called to the value of salicylate of methyl (oil of gaultheria) in rheumatic affections. In two cases the rheumatism was gonorrhœal, and in both these cases the treatment did good.

The part which is affected is surrounded with lint which has been moistened by the application of 1 or 2 teaspoonfuls of the oil; this is then covered with a sheet of gutta-percha, and the entire limb carefully wrapped in an outside bandage, which is applied in such a way as to prevent the heat of the body from vaporizing the drug and permitting it to escape into the air. Locally, this treatment may produce reddening of the skin, and, if it is continued for some time, actual desquamation of the cuticle; but this is not painful, since anæsthesia is developed. Editorial (Therap. Gaz., Feb., '97).

GELSEMIUM.—Gelsemium, U. S. P., or yellow jasmine, is the dried rhizome

and rootlets of the *Gelsemium semper-virens*, a climbing plant indigenous to the southern United States. The odor is aromatic and oppressive and the taste bitter. Gelsemium contains a resinoid, gelsemin; an acid, gelsemic or gelseminic acid; and an alkaloid, gelseminine, which occurs in small, white, microscopical crystals which have no odor, but an intensely-persistent, bitter taste. The alkaloid forms salts which are freely soluble in water. The alkaloid itself is soluble in alcohol, ether, and chloroform.

Preparations and Dose.—Extract of gelsemium, fluid, 2 to 3 minims.

Tincture of gelsemium, 2 to 15 minims.

Gelseminine (alkaloid and salts), $\frac{1}{120}$ to $\frac{1}{30}$ grain.

Physiological Action.—Preparations of gelsemium do not produce gastric irritation. The active principle diffuses into the blood with great facility. In moderate doses gelsemium causes a feeling of languor and calm, slowing of the heart-action, drooping of the eyelids, dilatation of the pupils, and some feebleness of muscular movement. In larger doses gelsemium causes vertigo, amblyopia, diplopia, paralysis of the muscles of the upper eyelid so that it cannot be raised, dilated pupil, labored respiration, slow and feeble action of the heart, great muscular weakness, and diminished sensibility to pain and touch. These effects follow in a half-hour after stomach ingestion and last two or three hours, when they subside. (Bartholow.)

Case in which 10-minim doses of the fluid extract of gelsemium caused marked reduction of the pulse: it was then brought to 42 by an 11-drop dose. J. A. Muenich (Med. World, Aug., '91).

Poisoning by Gelsemium.—When lethal doses are taken the physiological effects are intensified. A staggering gait

is followed by a loss of muscular power and a sense of general numbness over the whole body. The eyelids close, the muscles being paralyzed; the pupils become widely dilated and fail to respond to the stimulus of light; vision is lost. The lower jaw drops, the tongue becomes paralyzed, and speech is lost. The respirations are irregular, shallow, and labored. The heart-action is feeble and intermittent. The skin is generally covered with a profuse perspiration. The body-heat is markedly lowered. Internal strabismus is apt to occur (paralysis of sixth pair); the face becomes pinched and anxious. Death occurs from centric respiratory failure.

Case of poisoning observed from the tincture of gelsemium administered to a woman, aged 40, suffering from severe neuralgia; 10-minim doses every two or three hours were given the first day, and, no relief being obtained, 20-minim doses were administered for another twenty-four hours. Symptoms of poisoning then came on, consisting in a total loss of power in the tongue, alteration in vision, with widely-dilated pupils, and uncertain power of the muscles of the hand and arm. The patient was perfectly conscious. Then $\frac{1}{120}$ grain of strychnine was injected, and in ten minutes a change for the better was noted. The vision was not perfectly restored for some hours. Edward Jepson (Brit. Med. Jour., Sept. 19, '91).

Though consciousness is present for a long time, drowsiness or stupor finally appears.

Treatment of Gelsemium Poisoning.—The evacuation of the stomach by means of emetics or the stomach-pump should be followed by the use of cardiac stimulants (ammonia and digitalis), the application of artificial respiration, external heat, and the hypodermic administration of atropine and strychnine to stimulate the respiratory centre. The maintenance of the horizontal posture is desirable

Faradization and the hot and cold douche are to be borne in mind.

Therapeutics.—Exaltation of sensory or motor function is an indication for the use of gelsemium. Small doses should be used at first, until the susceptibility of the patient is ascertained. Ptosis, or drooping of the upper eyelid, gives warning that the physiological action of the drug is present.

CEREBRAL DISORDERS.—In mania with great motor excitement and wakefulness, Bartholow considers gelsemium superior to conium.

To produce the best results, sufficiently large doses should be given to produce definite physiological effects: dilated pupil, drooping of the eyelids, and a feeling of languor. The excitement incident to acute alcoholism, simple wakefulness, and the insomnia following too great mental or physical activity are often benefited by gelsemium. In meningitis and cerebro-spinal meningitis, Bartholow recommends the fluid extract in 5-minim doses every two hours to maintain the physiological effect.

There is no drug equal to gelsemium in those crises of cerebral excitement which were formerly combated by asa-fœtida and valerian. It should be pushed until heaviness of the lids and diplopia result. It is also useful in the early stages of acute bronchitis and in neuralgias. For the latter affection 3 to 5 drops should be given every $\frac{1}{2}$ to 1 hour, according to the intensity of the pain. The remedy can be used in all forms of organic disease of the heart without danger in ordinary doses. G. M. Garland (Boston Med. and Surg. Jour., Sept. 13, '88).

SPASMODIC DISORDERS.—In spasmodic cough, with little or no secretion from the bronchial tubes, gelsemium generally gives prompt relief. It has been recommended as a useful remedy in the spasmodic stage of pertussis, the nervous

cough of hysteria, the nagging cough of phthisis with scanty secretion, and in reflex cough from irritation of the laryngeal nerves. Hysterical spasms are controlled by gelsemium, the patient becoming calm and tractable.

Gelsemium recommended to control an hysterical patient or relieve a cough. The tincture of the green root, in doses of 2 to 20 drops, has proved most reliable. G. F. Schreiber (Peoria Monthly Med., Dec., '89).

Chorea, laryngismus stridulus, and spasmodic dysuria have yielded to gelsemium in many cases. Torticollis and localized facial spasm may be relieved by the drug.

NEURALGIAS.—Facial, intercostal, ovarian, and other neuralgias have proved amenable to gelsemium. Large doses are sometimes necessary, relief not appearing until the characteristic drooping of the eye, dilated pupil, and muscular languor appear. From 5 to 20 minims of the fluid extract every three hours may be required.

Gelsemium considered the remedy *par excellence* for neuralgias of the lower jaw and the acute congestive stage of cold in the head. Fifteen to 25 minims of the fluid extract taken at night upon retiring will dispose of the latter affection. It is useful in dysuria from whatever cause, as well as in the treatment of gonorrhœa when given in full doses and combined with an alkali. W. F. Jackson (Therap. Gaz., Nov. 15, '88).

FEVERS.—Bartholow has witnessed excellent results from the use of gelsemium in pneumonia and pleurisy. In the former it diminished respiratory activity, affording rest to the inflamed organ; it allays cough, lessens stasis of the pulmonary capillaries, and lowers the temperature. He suggests 5 to 10 minims of the fluid extract every two hours to maintain a safe, constant effect. The same method is employed in pleurisy.

Given in small doses,—that is, a teaspoonful of a solution containing 5 drops of the fluid extract in 4 ounces of water,—gelsemium has produced excellent results in cases of pneumonia; these were even more satisfactory when the drug was combined with aconite in the same proportion. J. Lindsay Porteous (Edinburgh Med. Jour., Dec., '90).

In remittent and intermittent fevers, when the temperature is high, the pulse rapid or full, the pupils contracted, breathing rapid, full doses of gelsemium should be given. J. F. Griffin (Med. Summary, Aug., '91).

Bilious and malarial fevers have been treated by the administration of gelsemium, especially in the Southern States, where it has enjoyed the reputation of a specific. Its utility is probably due to its antipyretic action.

SKIN DISORDERS.—Buckley has recommended gelsemium for the relief of itching in eczema: 3 to 10 drops of the tincture are given and increased every half-hour until the physiological effects are observed or the patient relieved. Not more than 1 drachm should be given in all within two hours.

MYDRIASIS.—Gelseminine in watery solution (1 to 64) has been recommended by Tweedy for use as a mydriatic. He believes it equal to atropine. The effects disappear more rapidly. Its use is not without danger; it has not come into general favor.

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GENERAL PARESIS OF THE INSANE. See INSANITY.

GENTIAN.—Gentian (*Gentiana*, U. S. P.) is the root of the *Gentiana lutea*, or yellow gentian, indigenous to Europe. The root contains a bitter principle, gentianin, and an acid, gentianic or gentisic acid.

Preparations and Doses.—Gentiana, 5 to 30 grains.

Extract of gentian, 5 to 10 grains.

Extract of gentian, fluid, 10 to 30 minims.

Tincture of gentian comp., 1 to 8 drachms.

Physiological Action.—Gentian increases the flow of saliva and the secretion of the gastric juice. Increased appetite follows its use. Authorities believe this favorable influence on the appetite to be due to two factors: the sense of bitterness, which increases the desire for food, and the improved digestive powers which, enabling more food to be disposed of, postpones the sense of satiety.

Gentian is capable of exciting the automatic centres of the stomach, and of thus exaggerating its movements. Ferray (*La Tribune Méd.*, May 28, '91).

It favors assimilation by removing morbid conditions of the intestinal mucous membranes. This healthy stimulation ceases after long use, and the effects of overstimulation are observed.

Therapeutics.—Gentian is a valuable bitter tonic. It is indicated in convalescence from acute maladies, in atonic dyspepsia, in chronic gastric catarrh, in malarial fevers, and in chronic malarial poisoning. The compound tincture of gentian (gentian, orange-peel, and cardamom-seeds) is a very useful stomachic.

Gentiana quinqueflora is a reliable prophylactic against abortion and all uterine disorders. It is especially valuable in menorrhagia or metrorrhagia depending wholly upon systemic causes. The author uses a tincture prepared as follows: *Gentiana quinqueflora*, bruised fine, 4 ounces; alcohol, 24 ounces; pure distilled water, 8 ounces. The mixture is allowed to stand for fourteen days; it is then filtered and ready for use. The tincture is given in doses of a tablespoonful every four hours. J. R. Cross (*Med. Brief*, Mar., '92).

GENU VALGUM AND VARUM. See JOINTS, DEFORMITIES OF.

GERMAN MEASLES. See RUBELLA.

GESTATION, ECTOPIC. See PREGNANCY.

GLANDERS, or FARCY.

Definition.—This disease develops primarily in the nasal passages and bronchial tubes of horses and cattle, producing a mucous flow. It has been found to be due to the bacillus mallei. Large nodules form in the respiratory passages, and metastatic nodules in the liver, spleen, etc.

Symptoms.—In man the disease does not often present itself. However, veterinary surgeons, butchers, and those surrounded with horses are likely to contract the disease. It occurs in the conjunctiva and on the skin after some insignificant injury. Nodules result and the disease sometimes takes an acute form, beginning generally with malaise, pain in the limbs and back, and terminates in the breaking out of several abscesses over the body.

Case of chronic glanders in which the patient's body was covered with hard swellings. After a period of illness characterized by fever, prostration, diarrhoea, and bloody passages, he died from exhaustion, none of the surface lesions having ulcerated. Editorial (Brit. Med. Jour., July 28, '88).

Bacilli of glanders can gain access to the body through the unbroken skin, penetrating the hair-follicles, traversing the epithelial cells, and producing the induration which characterizes the papules of the incipient disorder. Babès (Lancet, Aug. 25, '88).

Case of a coachman observed into whose system the glanders bacilli gained entrance by means of a wound of the finger. Multiple abscesses appeared in all parts of the body. Not till a few

days before death was there a moderate discharge from the nose and increased salivary secretion. The patient died from exhaustion in six months. Proust (Revue d'Hygiène et de Police Sanitaire, Jan. 20, '88).

Glanders is allied to the chronic and infectious diseases, and its normal host is probably one of the domestic animals; the bacillus is a parasite of its host; and it resembles morphologically the other bacterial parasites that produce chronic diseases in man, especially tuberculosis and leprosy. Holmes (Jour. of the Amer. Med. Assoc., Aug. 12, '93).

Case of glanders which was remarkable for the fact that the large joints—*i.e.* the elbow, the knees, and the ankles—showed suppurative inflammation, while the multiple abscesses in the muscles were absent. Errich (Zeitr. z. klin. Chir., vol. xvii, sec. 1).

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Case of acute glanders characterized by the development in all the extremities of fluctuating tumors that contained hæmorrhagic pus. There were numerous broncho-pneumonic foci in the lungs. Toward the end of the disease a general pustular eruption appeared, and periostitis developed over the frontal bones. The diagnosis was confirmed by bacteriological investigation. Forestier (Lyon Méd., No. 6, '97).

Diagnosis.—When the disease occurs in the mouth or nose bacilli can be found in the mucous flow. When the disease starts internally the bacillus may be found in the sputum, or when the secondary abscesses form. It is of the greatest importance that these should be early recognized.

Case of perforating ulcer of the hard palate, with foul discharge from the nose and ear and gumma-like indurations appearing in various parts of the body, treated for some time as syphilis, till, after several months, the characteristic farcy-buds containing the glanders bacilli made their appearance. Death oc-

curred from exhaustion. Editorial (Brit. Med. Jour., June 16, '88).

Case in which the rapid diagnosis of glanders was made, after the method of Straus, by the inoculation of the suspected material into male guinea-pigs, which presented, after the second or third day, a marked glandular affection of the testicles, which is a special form of localization for this material. Silveira (La Semaine Méd., June 17, '91).

The surest means for the diagnosis of pulmonary and nasal glanders is to inoculate some of the morbid products into cats and guinea-pigs, and to make control experiments with cultures on potato. If the animal dies of glanders, and the culture consists of the malleus bacillus, there is no longer any doubt about the disease; but this as a diagnostic means is not always easy. Helman has found a simpler means, in an extract of the malleus bacillus. This extract, called mallein, produces on horses attacked with glanders an elevation of temperature of from 0.9° to 5.4° F., and forms, at the seat of inoculation, a tumor which increases rapidly for two or three days and then disappears. Glanders is present whenever the above symptoms appear in the horse after the injection of mallein. This diagnostic procedure has already been adopted in the German army. Semmer and Wladinirow (Revue Internat. de Bibliog., June 25, '93).

Treatment.—When the cause is local, energetic measures should be pursued. The erosion or seat of infection should be completely removed by means of the knife, and cauterizing by means of the thermocautery. Constitutionally, the administration of mercury has been advocated, but it is doubtful if the case would not prove fatal before the proper constitutional remedies could be had.

Owing to the certain amount of analogy between glanders and tuberculosis, the authors have used the creasote treatment, as well as Lannelongue's chloride of zinc, in glanders. The results have been found most satisfactory. Claudius and Michel (La Semaine Méd., Aug. 24, '92).

Three cases of human glanders, one generalized and affecting especially the thorax, the other two localized, treated by gray ointment. The first case died the day after examination by the author. In the other two the abscesses were incised and disinfected, and friction with the gray ointment, 1 drachm daily, prescribed. Cure resulted in both. Gralovsky (Wratsch, No. 25, '93).

The injection of the serum of horses affected with glanders causes less rise of temperature in animals with the disease than the injection of mallein. Serum has been used for protective and curative, as well as for diagnostic, purposes. In one troop of cavalry twelve horses were injected, and after this no more cases of pulmonary glanders appeared. Repeated injections are necessary for protection. Schneidemuhl (Brit. Med. Jour., Apr. 29, '93).

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GLOSSITIS. See TONGUE, DISORDERS OF.

GLOSSO-LABIO-LARYNGEAL PARALYSIS. See PARALYSES.

GLOTTIS, ŒDEMA OF. See LARYNGITIS.

GLYCERIN.—Glycerin (Glycerinum, U. S. P.) is a colorless, syrupy liquid, of a sweet, warm taste. It is obtained by the saponification of fats. It is soluble in water and alcohol. Exposed to the air it does not become rancid or undergo fermentation, and it increases in weight on account of its great hygroscopic powers. Glycerin possesses decided antiseptic and solvent powers.

Preparations and Doses.—Glycerin, 5 to 120 minims.

Glycerite of carbolic acid, 2 to 5 minims.

Glycerite of tannic acid (tannic acid, 20 per cent.), used locally.

Glycerite of starch, used locally.

Boroglyceride.

Glycerite of hydrastis, used externally.

Glycerite of vitellis (glyconin), used for emulsifying.

Glycerin suppositories.

Physiological Action.—Glycerin in the pure state is slightly irritating when applied locally to the skin or to the mucous membranes; it excites the secretions and causes an increased flow of blood to the parts; in some subjects it produces pain and decided irritation. The ingestion of glycerin causes no appreciable systemic effects. It sometimes acts as a laxative, but does not seem to affect digestion. Injected into the circulation in large amounts, glycerin causes convulsions, due to its hydropscopic powers (Hare). Although Pavy asserts that the ingestion of glycerin by diabetic patients increases the polyuria, others believe the contrary to be true, and find advantage in its use. The glycerin in stores other than responsible pharmacies is apt to contain arsenic. Vegetable glycerin should be preferred.

Case in which glycerin was taken for diabetes, in large quantities. Symptoms similar to *cholera nostras* appeared. The diagnosis was obscure until a publication by Ritzert showed that the common glycerin of the shops contained large quantities of arsenic. Jaroschi (Wiener med. Presse, June 9, '89).

Only the vegetable glycerin should be employed, as that derived from the animal fats is thoroughly impure. Animal glycerin has not the same solvent powers, and is, moreover, liable to become rancid. The failures of various observers to corroborate the claims made for glycerin in phthisis and in diabetes has been due to the fact that they failed to use vegetable glycerin. For topical treatment, too, the animal glycerin is much inferior, since it dries more quickly. W. H. Morse (Maryland Med. Jour., Dec. 31, '87).

Glycerin will stop the souring of milk, and is therefore a valuable aid to the diet of bottle-fed children. W. B. Moore (Maritime Med. News, July, '89).

Therapeutics.—Good results have been obtained in the use of glycerin as a substitute for sugar in the alimentation of diabetic patients, but care must be taken that pure glycerin be administered.

Certain forms of glycosuria may be checked by glycerin. It acts more efficiently when introduced into the alimentary canal than when injected subcutaneously. It checks glycosuria by inhibiting the formation of sugar in the liver. By this means glycerin increases the quantity of glycogen found in the liver. Ranson (Jour. of Physiology, vol. vii, p. 202, '89).

[According to the clinical researches of Pavy, glycerin increases the polyuria of diabetes almost one-half, and for this reason he thinks it is not to be employed in this class of cases as a substitute for sugar. The quantity of glycerin recommended to be given, clinically, is 1 drachm, diluted with water at least one-half. H. A. HARE, Assoc. Ed., Annual, '90.]

CONSTIPATION.—In constipation the use of glycerin suppositories is followed by excellent results, but a too long-continued use may produce rectal irritation. When suppositories are not available, or for any other reason, glycerin may be given by rectal injection, 1 to 4 drachms being used.

Glycerin enemata tried in a long series of cases with good results. In patients with hemorrhoids, however, the insertion of any syringe may be productive of pain. In 20 cases hollow suppositories of cacao-butter employed, each containing 15 minims of pure glycerin. This dose was found sufficiently large, and acting in fifteen to twenty minutes. It was never necessary to use more than one suppository, though there would be no objection to giving two. Boas (Deutsche med. Woch., No. 23, '88).

Suppositories prepared by the addition

of stearin and those put up with cacao tried. With the first preparation, in 208 cases, in which the results were noted, in 136 the desired effect was obtained and in 72 there was failure. The second kind of suppositories yielded better results, there being only 53 failures out of 230 trials. M. Schmelcher (*Therap. Monats.*, June, '89).

Glycerin enemata tried in 26 cases, besides children, and it was found that 50 minims at once produced a copious evacuation, without leaving any disagreeable sensation. In no case did the drug lose its effect, though sometimes given regularly for many months. Seifert (*Münch. med. Woch.*, No. 9, '88).

Toxæmic symptoms may be suddenly produced by the use of ordinary enemata. A solution of some of the products of decomposition may take place, and a diffusible septic poison thus be introduced into the system by means of the lymph- and blood-vessels in that neighborhood. A rash may appear in these post-enemal cases, and, from appearances, cases have been pronounced scarlatina or röteln. No such symptoms or rash, however, have been observed in glycerin enemata, the amount injected being too small. G. H. Burford (*Lancet*, Dec. 15, '88).

The use of glycerin enemata in internal hæmorrhoids not approved. R. Lépine (*La Semaine Méd.*, Jan. 30, '89).

[In a few cases there has been observed a stinging in the rectum attending the injection, or a burning sensation, lasting a few minutes after the bowels were opened. It was found that this did not occur if the glycerin were mixed with a small quantity of water. In a few other instances there was actual rectal pain, due not so much to the action of the glycerin as to the passage of insufficiently softened feces. J. P. C. GRIFFITH, Assoc. Ed., *Annual*, '89.]

Injections of glycerin act very well in habitual constipation due to sedentary life, alimentation, etc. They are of little value, however, in cases where there is mechanical obstruction, and in constipation following febrile, cerebral, or medullary affections. Glycerin injections are of value in irreducible hernia, and

should be used from the beginning. Injections of glycerin are superior to suppositories. If made for some time at a given hour of the day, spontaneous evacuation of feces will eventually take place and the glycerin can be suspended. The injections are also useful during parturition, hastening the pain and the conclusion of the labor. In certain cases from 5 to 10 drops of glycerin are sufficient for an injection. A syringe should not be used, as there is danger of wounding the mucous membrane. Glycerin when thus employed, even for long periods, gives rise to no unpleasant symptoms. Anacker (*Deutsche med. Woch.*, No. 19, '93).

In acute coryza glycerin (1 part to 4 or 5 parts of water) may be used in spray or applied to the nares by a camel's-hair pencil. Diluted with equal parts of water, it is useful as a mouth-wash; it may be applied on a swab to relieve the dry mouth of typhoid fever or to facilitate the removal of sordes. If the sweet taste is objectionable Ringer suggests a mixture of equal parts of glycerin and lemon-juice. This is also useful in the last stages of chronic diseases, as phthisis, to relieve the dry, shiny condition of the mouth and tongue.

Glycerite of carbolic acid is a useful application to foul-smelling ulcers and open sores. Glycerite of tannic acid is a useful application in follicular tonsillitis and pharyngitis. Glycerite of starch is used as a vehicle for cutaneous remedies and as a bland protection to superficial abrasions and irritated surfaces. Glycerite of boroglyceride, an excellent dressing for ulcers, contused and lacerated wounds, etc., also does good service as a depletant to the cervix uteri, a tampon, being soaked in it, applied locally to the cervix and renewed daily. In pelvic congestion the application of the tampons should be made two or three times daily, each application being preceded by a copious hot-douching.

If the vaginal secretions be scanty the local use of glycerin increases them, but if the secretions be abundant they are not affected by the application of the glycerin. Herman (Brit. Med. Jour., Dec. 15, '89).

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Intra-uterine injections of sterilized glycerin in cases of fibromyoma recommended. A little over a drachm is slowly injected every two or three days, the vagina being subsequently tamponed with cotton or gauze saturated with boroglyceride. The effect of the drug is to cause dryness and atrophy of the endometrium, and hence diminution of the tumor. Chéron (Rev. Internat. de Méd. et Chir. Prat., No. 6, '96).

The accidents that have occurred in the induction of labor by the injection of glycerin were caused by the drug's being used in large doses for hygroscopical purposes, and not with the more physiological purpose of stimulating the unstriated muscle. The writer has used glycerin injections in two cases with marked success. He concludes that the injection of 5 cubic centimetres of glycerin into the cervical canal will bring on strong pains without leading to nephritis or any other ill-effect. It is free from danger of infection which attends injection into the uterine cavity. The introduction of a colpeurynter into the vagina serves to keep up the pains when they have started, and, therefore, makes further injection of glycerin unnecessary. Kossmann (Therap. Monats., June, '96).

Glycerite of egg-yolk, or glycerin, besides being useful in preparing emulsions, is an excellent application for chapped hands or face. For this latter purpose glycerin, diluted with 1 to 3 parts of rose-water or orange-flower water, is an elegant preparation. Glycerite of hydrastis is a soothing and alterative application to unhealthy and sloughing sores, old leg-ulcers, and sloughing cancerous growths.

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GLYCOSURIA.

Definition.—Evacuation of urine containing sugar in sufficient quantity to be revealed by the ordinary tests.

Symptoms.—Glycosuria is a symptom occurring under various conditions and compatible with perfect health; transitory glycosuria does not give any morbid symptoms and is only revealed by examination of the urine.

Literature of '96-'97-'98.

Case of a man, aged 25, who accidentally discovered the presence of sugar in his urine. He had no symptoms whatever of diabetes. He was the oldest of 11 children, and examination of the specimens from the other 10 showed high specific gravity and the presence of more or less sugar in all. They were all healthy and passed a normal quantity of urine. The patient passed about 10 per cent. of sugar a day, but this quantity could be somewhat reduced by an exclusive milk diet. L. C. Wadsworth (Med. Rec., May 29, '97).

The amount of sugar contained in the urine may be determined by various tests (*vide* DIABETES MELLITUS), of which Tromner's and Fehling's are commonly preferred.

Etiology.—Glucose, or dextrose, is a constituent of normal urine, but it is present in too small a quantity to be discovered by the ordinary tests. By the aid of the phenylhydrazin test, however, the presence of a small amount of glucose may be revealed in every sample of urine. Pavy estimates the quantity of sugar formed in healthy urine to be 0.5 per mille. The quantity of sugar contained in the urine is dependent on the amount of sugar present in the blood. According to experiences of Pavy, normal blood contains 0.6,—1 per mille of glucose; v. Noorden states that the urine will contain sugar enough to be revealed by the ordinary tests as soon as the

amount of sugar in the blood exceeds 0.2 per cent. This may be obtained experimentally by ingestion of large quantities of sugar, and in this form of glycosuria—alimentary glycosuria—the variety of sugar in the urine is always identical with that ingested: By ingestion of dextrose, glycosuria, or dextrosuria, is caused; by the ingestion of lactose, lactosuria; saccharose, saccharosuria, etc.

The amount of sugar necessary to produce glycosuria in a healthy person has been found to be:—

Of dextrose, or glucose, more than 180-250 grammes.

Of saccharose, more than 200 grammes.

Of levulose, more than 200 grammes.

Of lactose, more than 120 grammes.

When the stomach is full even larger quantities can be absorbed without causing glycosuria. Alimentary glycosuria cannot be produced in healthy persons by ingestion of starch.

[Miura (*Zeits. f. Biol.*, B. 32) took one morning 1200 grammes of rice cooled in water—containing 308 grammes of starch; he experienced no consecutive glycosuria. F. LEVISON.]

Physiological glycosuria can be differentiated from the pathological variety by the administration of a starch, such as that contained in white bread. It always causes an increase in the glucose in the urine of diabetics, but does not influence the sugar in normal cases. Rosenfeld (*Deutsche med. Woch.*, Nos. 23, 24, '88).

In the urine of lying-in women lactose generally appears between the second and fourth days of lactation; it again disappears after a short time. When the secretion of milk is suddenly stopped large quantities of lactose are for some time excreted with the urine.

[Zuelzer administered sugar of milk to lying-in women ("Inaugural Dissertation." Berlin, '95) and found that this substance is more easily eliminated in the

puerperal state than in the normal state. F. LEVISON.]

In women during gestation the administration of 100 grammes of grape-sugar followed by appearance of from 1 to 18 grammes in the urine. Alimentary glycosuria frequently found in the course of traumatic neuroses, and in cases of phosphorus poisoning, in which fatty degeneration of the liver has occurred, 20 per cent. of the sugar administered is excreted in a few hours. V. Jaksch (*Centralb. f. innere Med.*, May 25, '95).

In various diseases alimentary glycosuria is more easily produced than in health; this has been tried by giving small quantities of sugar (less than 150 grammes of glucose) to patients suffering from various diseases. The result of these experiences has been very unsatisfactory. Diseases of the brain, the spinal cord, the peripheral nerves, the muscles, and functional neuroses do not seem to predispose to alimentary glycosuria.

[Chvostek found that in exophthalmic goitre (*Wien. klin. Woch.*, '92) alimentary glycosuria was more easily produced than in the normal state. In diseases of the heart and lungs the result was negative and in disease of the liver it was inconstant.

V. Jaksch (*Prager med. Woch.*, '95) found alimentary glycosuria in acute poisoning with phosphorus and in a case of icterus with hæmorrhagic diathesis and atrophy of the liver. F. LEVISON.]

Experiments with 50 patients to determine the limit of assimilation for grape-sugar; that is, the quantity that can be given before glycosuria, in some cases of which the quantity necessary to produce glycosuria was very small. Intestinal, circulatory, and respiratory diseases, as well as those affecting metabolism or the liver, did not exercise much influence. Bloch (*Zeit. f. klin. Med.*, B. 22, H. 525).

For each person and for each sugar there is an individual "co-efficient of utilization," increasing within certain limits with the quantity of ingested sugar. Linossier and Roque (*L'Union Méd.*, No. 13, p. 150, '95).

Experiments showing that when 5 to 10 ounces of syrup were taken in the day, alimentary glycosuria was present in 11 out of 21 cases of lead colic. As a rule, the glycosuria disappeared with the colic. This glycosuria is especially frequent in those who have worked for a long time in lead.

Lead acts directly on the nutrition of the hepatic cell. The glycosuria is fleeting because the lesion to the cells is slight. That some patients with mild colic do not have alimentary glycosuria must depend on individual peculiarities. The glycosuria is frequently accompanied by urobilinuria. Brunelle (*Brit. Med. Jour.*, Jan. 2, '95).

Alimentary glycosuria is a constant symptom of some functional neuroses, such as Charcot's grand hysteria and traumatic neuroses; in the latter affection it may also be of value in differential diagnosis from simulation. Jaksch (*Inter. klin. Rund.*, Sept. 15, '95).

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Acute febrile conditions favor the occurrence of alimentary glycosuria. Croupous pneumonia seems especially prone to this, though typhoid fever, angina, articular rheumatism, and scarlatina also furnish examples. Poll (*Fortschritte der Med.*, No. 13, '96).

Glycosuria can be produced in a healthy man by giving a large quantity of glucose early in the morning, the stomach being empty. The quantity of glucose necessary to produce this effect varies from 4½ to 5 ounces. It is necessary that this quantity be given all at once. The occurrence of this so-called alimentary glycosuria depends not only on the quantity of glucose taken, but also on the rapidity of absorption.

In cases of marasmus, anemia, cirrhosis of the liver, progressive muscular atrophy, and arteriosclerosis no diminished power of sugar destruction could be detected. But in cases of neurasthenia or traumatic neuroses there was a diminished power of sugar destruction, and glycosuria could be induced more readily than in health. In cases of habitual drinkers of large quantities of beer, glycosuria could be readily induced by 3,

2½, or even 1½ ounces of grape-sugar. The same condition the author discovered in some cases after the drinking of an excessive quantity of beer (2 quarts) rapidly. Alimentary glycosuria does not occur in all great beer-drinkers. A. Strümpell (*Berliner klin. Woch.*, No. 46, '96).

Examinations made on Jena students. The proportion of these in whose urine sugar appeared varied much with different kinds of beer; but was much greater after the morning drinking. Out of 14 who drank bock or export beer in the morning, 5 had glycosuria. After the evening drinking, amounting in one case to seven litres, out of 19 only 1 had sugar in the urine, or with Bavarian beer 1 out of 11. The individual disposition was very evident. Not those who drank most had glycosuria. The difference between morning and evening drinking was probably due to variations in the absorption. Krehl (*Centralb. f. innere Med.*, No. 40, '97).

Transitory glycosuria has been observed after concussion of the brain and apoplexy, after violent neuralgia and mental sufferings.

Glycosuria produced in dogs by irritating the peripheral end of the pneumogastric nerve. Generally the symptom appears in three or four days after the injury. Arthaud and Butte (*La Tribune Méd.*, Feb. 19, '88).

Glycosuria produced in a rabbit by daily puncture of the floor of the fourth ventricle. Laborde (*La Semaine Méd.*, Feb. 29, '88).

Case of occlusion of the nares, attended with various trophic disorders and with glycosuria, in which the symptoms disappeared after the removal of the nasal obstruction. The occurrence of the glycosuria is ascribed to the diminished oxidation and the circulatory disturbance resulting from interference with respiration and to a reflex effect upon the medulla oblongata. Bayer (*Wiener med. Presse*, No. 15, '94).

Case of urticaria seen in which glycosuria was a marked symptom. Billstein (*Med. News*, Sept. 15, '94).

Case of glycosuria in which death followed speedily after the passage of a sound employed to search for vesical calculus. Glycosuria may cause localized urinary symptoms, thus causing danger of vesical instrumentation in these cases. Bazy (*Archives Générales de Méd.*, June, '95).

Case of glycosuria apparently dependent upon the presence of numerous thread-worms in a child of 5 years. After expulsion of the worms by *santonin* the glycosuria disappeared and the child regained its former health. Parry (*Brit. Med. Jour.*, June 8, '95).

Study made of 211 cases of head-injuries in order to determine the frequency of traumatic glycosuria and its possible relation to the nature of the lesion. There were in the 211 cases 20 that presented glycosuria.

Conclusions: 1. After head-injury sugar may appear in the urine as early as six hours and disappear within twenty-four, the average time for its appearance, however, being from eight to twelve hours; for the disappearance of the same, from the fifth to the ninth day. 2. A small proportion of the cases may exhibit a permanent glycosuria from the date of injury to the head. 3. Acetone and diacetic acid are rarely, if ever, found in such cases, excepting where the condition becomes a permanent glycosuria, and even then probably only after a number of months or years. 4. Of the 20 sugar cases here recorded, 11 (55 per cent.) had received an injury to the right side of the head; 5 (25 per cent.) to the left side; 3 (15 per cent.) to the occiput; and in 2 (10 per cent.) there were no external evidences of violence. 5. Of the 20 cases, 8 died,—6 deaths being the direct result of severe injuries, 1 from intercurrent disease, and the third probably from alcoholism. In the 211 cases, 16 were fatal, 50 per cent. of these having glycosuria. Higgins and Ogden (*Boston Med. and Surg. Jour.*, Feb. 28, '95).

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In frogs with a normal liver glycosuria constantly follows tying all four limbs with the animal lying on its back; in

the prone position it is evoked only by very powerful traction. If the liver is not normal the glycosuria does not occur, and it can be prevented in any case by division of the sciatic nerves. Confinement of a frog head downward in a narrow cylinder so that it is unable to move entails glycosuria, which is here also prevented by section of the sciatics. Extirpation of the liver inhibits this "restraint glycosuria." Restraint glycosuria is unaffected by stimulation of the sciatics, which of itself tends to cause the appearance of sugar in the urine; similar effects follow section of the cord above the entrance of the roots of the sciatic and also perforation of the lumbar cord. Bilateral extirpation of the lungs or obstruction of the air-passages causes glycosuria. Hence restraint glycosuria may originate from an unusual position of the body, from powerful motor-nerve stimulation, and from great diminution of the respiratory capacity. Velich (*Wien. klin. Rund.*, May 17 and 24, '96).

Temporary glycosuria may result from strangulation of the duodenum or jejunum in man, but that this condition exerts no unfavorable influence upon the course of the wound, and affords no contra-indication to general anæsthesia. F. Neugebauer (*Wien. klin. Woch.*, Sept. 10, '96).

Glycosuria is a symptom of cancer of the pancreas. It only shows itself in the early period and disappears toward the end. François Guillon (*Gaz. Méd. de Nantes*, July 23, '98).

(See DIABETES MELLITUS for pancreatic glycosuria.)

It is also seen consequent to poisoning by various poisons: morphine, prussic acid, mineral acids, nitrite of amyl, carbonic oxide, chloralamid, nitrobenzol, *secale cornutum*, etc.

[V. Mering (*Congr. f. innere Med.*, '86) and Minkowski (*Berl. klin. Woch.*, '92) demonstrated that it is possible by injection or ingestion of phloridzin, a glucoside contained in the root-bark of apple-trees, to provoke a marked glycosuria in animals or in man. F. LEVISON.]

While in toxic doses the salicylates

cause the appearance of glycosuria, before the deafness, tinnitus, and concomitant symptoms no sugar can be detected, although salicyluric acid is present in appreciable quantity. Burton (Lancet, June 2, '88).

[By extirpation of the pancreas of dogs, Minkowski (Arch. f. exper. Path. u. Pharm., '93) was able to produce not only glycosuria, but all the symptoms of diabetes mellitus. F. LEVISON.]

When the pancreas is completely extirpated glycosuria results, though, if even a small portion of the pancreas remains in the abdominal cavity, this result does not appear. Hedon (Archives de Physiol., Normale et Path., p. 788, '94).

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Case of glycosuria for which no adequate cause could be found, but which was evidently associated with considerable gastro-intestinal disturbance. At the autopsy it was found that the pancreas had been almost entirely destroyed by a large suppurating cyst. M. McIntosh (Lancet, Oct. 24, '96).

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GOITRE.—Lat., *guttur*, throat.

Definition.—The terms “goitre,” “bronchocele,” and “struma” include all those conditions in which there is a persistent enlargement of the whole or a portion of the thyroid gland.

Such enlargement, most often *benign*, may, however, be also brought about by malignant growth within the organ, and, in that case, one speaks of *malignant* goitre; but it may be laid down that, in all the conditions included under this term, there is some hypertrophy or overdevelopment of one or other of the tissues of which the gland is composed.

Thus, in a goitre, we may distinguish:

1. A general hyperplasia of the gland, all the tissues having undergone overgrowth.

2. We may find the follicles showing marked hypertrophy, with or without distension of their lumina with colloid material (parenchymatous and colloid goitre).

3. We may have to deal more especially with overgrowth of the interstitial substance (fibrous goitre).

4. Or, again, we may have to deal more especially with great distension of the vessels, more frequently of the veins, though some rare cases are recorded of aneurismal dilatation of the arteries (vascular goitre).

Such changes may either involve the whole of one or both lobes, or be confined to isolated portions of the gland. In the former case we have to deal more especially with the vascular and hyperplastic forms. In the latter the change most often begins with the parenchyma and the goitre develops in a nodular form. But both in the hyperplastic as in the nodular parenchymatous goitre the shape and appearance may be profoundly influenced by cysts. These cysts may attain considerable size and may be single or multiple.

Varieties.—Wölfler, who has written the fullest work upon the pathological anatomy of goitre, gives anatomical divisions which, however, are too elaborate for practical purposes. For the clinician this classification may be greatly simplified.

[Wölfler's classification is as follows:—

I. CONGENITAL. — 1. Hyperplastic. 2. Telangiectasic. 3. Cystic. 4. Adenomatous.

II. HYPERPLASTIC.—1. True. 2. Colloid.

III. ADENOMA.—1. *Fatal Adenoma*.—Formed of embryonal cells not differentiated in the vesicles, forming nodules varying in size from a pin-point to a hen's egg, and tending to hæmorrhage and development of large cysts. He further distinguishes several varieties of

this form, namely: the vesicular, the acinous, the myxomatous, the fibrous, the angiocavernous, and the papillary form.

2. *Adenoma Gelatinosum*.—There is general enlargement of the lobe or of the whole gland. Two forms of this may be distinguished: (a) the acinous, quite the most common form of goitre, in which there is a growth of new gland-tissue with development of vesicles between the existing acini, which also undergo continued growth. In the vesicles new and old there is abundant development of colloid material. (b) The cyst-adenoma, in which the individual vesicles become greatly distended and may be the seat of intravascular papillary growth either exogenous, or endogenous; this form tends toward malignancy.

3. *Myromatous*.—Here the normal follicles present contain little or no colloid, but are surrounded by an excessive hyaline or myxomatous stroma; the areas showing this change are nodular.

4. *Adenoma Cylindro-cellulare*.

IV. MALIGNANT ADENOMA. — Under this heading Wölfler includes the following forms: Growths within the gland having a carcinomatous appearance, but characterized by absence of metastases.

Simple typical adenoma of the gland with adenomatous metastases.

Simple gelatinous goitre with metastases.

V. CARCINOMA PROPER.—(a) Alveolar; (b) cylindrical; (c) squamous celled; this last apparently a modification of the previous form in which the cells are flattened instead of being cubical.

VI. CONNECTIVE-TISSUE GROWTHS.—(a) Fibroma. (b) Sarcoma, of which the following varieties have been described: Fibrosarcoma, round-celled, giant-celled, angiocavernous, and spindle-celled sarcoma.

VII. INFLAMMATORY ENLARGEMENT (ABSCESS-FORMATION).—Abscess-formation is very frequently metastatic (pyæmia); some cases are recorded of idiopathic abscess-development; other cases are recorded in which there has been diffuse infiltration of pus through the lobe of the organ between and in the alveoli and vesicles.

VIII. HÆMORRHAGIC ENLARGEMENT.

Such hæmorrhages are very extensive; they may be said always to occur in gland-tissues already the seat of the goitrous change. J. GEORGE ADAMI.]

We may recognize the following forms:

(A) ACUTE GOITRE.—This form comes on very suddenly and is characterized by rapid enlargement of the gland, due primarily to vascular dilatation, found more especially among women.

(B) CHRONIC GOITRE.—I. *Congenital*.—This may be of very varying forms, as above indicated in Wölfler's classification. It is relatively rare.

II. *Vascular Goitre*.—This is most frequently due to a distension of the abundant venous plexus of the gland; the organ is generally enlarged and is liable to press upon the trachea, causing modification of the voice and not infrequently paroxysmal attacks of dyspnoea simulating asthma. As above stated, this form may develop acutely.

III. *Parenchymatous Goitre*.—Under this heading is to be grouped the vast majority of cases of the disease. We have to recognize that, both in the general hyperplastic form and in the nodular, there may be great variation in the changes which occur. But these changes appear to be essentially connected with alterations in the structure and functions of the follicles.

1. Thus in one large class of cases there is, as the most prominent feature, a great storing up of the colloid material within the follicles, of isolated lobules of one lobe, or of the whole organ, and even in the lymph-spaces and—some would say—the blood-vessels of the gland. This is a form generally spoken of as *colloid goitre*, or *struma gelatinosum*.

2. *Adenomatous Goitre*.—In other cases we have to deal with the very opposite condition of marked overgrowth of the glandular epithelium in the more or less

embryonic condition with little development of colloid.

3. *Cystic Goitre*.—Whether we are dealing with the colloid or adenomatous type, there is a liability to cystic formation. In the colloid variety occasionally such cysts may be of the nature of *retention-cysts* and may resemble in their development the emphysematous bullæ met with in the lung, several follicles, through atrophy of their walls, fusing into one. But more frequently such cysts, as was pointed out years ago by Rokitsky and of late by Bradley, are of hæmorrhagic origin, the new growth in the gland being very vascular and the position of the organ and its varying blood-supply rendering the vessels peculiarly liable to rupture. Hence, are produced smaller or larger spaces filled with albuminous fluid, more or less tinged with modified blood-pigment, corresponding in every respect to the cysts which may develop in the brain after hæmorrhage in that organ.

Case of acute enlargement of the thyroid gland in chronic parenchymatous nephritis. The enlargement was due to a dropsy of the gland. The serous cavities were free from effusion. This condition regarded as a vasomotor neurosis in association with Bright's disease. W. A. Edwards (Inter. Med. Mag., Apr., '92).

Further changes may occur in such parenchymatous goitres: there may be hyaline or mucoid degeneration, calcification, intra-acinous growth, or the eventual development of cancer.

4. *Malignant parenchymatous goitre*, or primary carcinoma of the thyroid, as above stated, would seem almost to originate in a gland which may, for years, have been the seat of a more or less stationary parenchymatous goitre.

IV. *Interstitial goitres* are relatively rare. 1. Among the benign forms may

be recognized the myxomatous goitre, which is, in general, a parenchymatous or adenomatous goitre in which the interstitial tissue has undergone mucoid degeneration. 2. Fibroid goitre is always nodular, the nodules being recognized by their peculiar firmness and hardness. 3. Malignant interstitial goitre, or sarcoma, which is relatively rare, is characterized by its peculiarly rapid growth and by its tendency to ulcerate and to extend into the trachea or externally.

ACCESSORY THYROID BODIES.—Lying in the tissues between the hyoid bone and the aortic arch are occasionally to be found certain small bodies which at first sight may be mistaken for lymph-glands, but upon microscopical examination are seen to be of the nature of thyroid tissue. Gruber distinguishes between them the superior, inferior, and posterior glands.

These accessory glands occasionally become the seat of adenomatous or even carcinomatous enlargement, and may cause great difficulty in diagnosis. The posterior group, more especially lying behind the œsophagus or between the trachea and the œsophagus, must be kept in mind from the grave disturbances which may be caused, either in deglutition or in respiration, through their overgrowth.

Case of migratory goitre caused occasional attacks of cyanosis and dyspnoea. A small, movable tumor was seen on the right side of the neck. The tumor migrated at times toward the mediastinum, compressing the trachea and right innominate vein. Removal of a few adenomatous nodules and fixation of right half of thyroid resulted in a cure. M. A. Wölfler (Revue Gén. de Clin. et de Thérap., Sept. 26, '89).

Case of accessory thyroid in the base of the tongue, removed for great dysphagia. Recovery. Wolff (Gaz. Méd. de Paris, Oct. 10, '91).

Case of intralaryngeal thyroid tumor. There are only five or six such cases in literature. The patient complained of dyspnœa. On laryngoscopic examination a tumor could be seen under the right vocal cord. Three months later abscesses appeared in the left lobe of the thyroid, the patient finally dying of general septicæmia. On post-mortem examination the tumor was found to consist of thyroid tissue and to be connected with that gland. R. Paltauf (Wiener med. Woch., May 16, '91).

Symptoms. — **ACUTE GOITRE.** — This form differs from the main mass of cases in that, within the course of a few days or even a few hours, the thyroid may so swell as to produce peculiarly severe symptoms, more especially of impeded respiration, prolonged inspiration, and paroxysmal dyspnœa; it may be followed by evidences of bronchial catarrh. Kœnig notes that during the menstrual period, during which, as already stated, some hyperæmic enlargement of the thyroid may be noted, it is not uncommon for there to be a peculiarly raw cough and distinct modification of the voice directly due to this enlargement. In the more severe cases the respiratory disturbance may lead to death from asphyxia. Where death does not occur, the gland may gradually lessen in size and the goitre disappear.

CHRONIC GOITRE. — In goitrous regions it is a matter of common observation that the localized or generalized enlargement of the gland may, during a course of years, attain a very large size without causing its owner anything more than the discomfort attached to its weight and its position. If the gland undergoes a general slow hypertrophy, the firm growth of the whole, by forming, as it were, a well-built arch surrounding the trachea, may lead to singularly little disturbance, and, where there is disturbance, it is more often due,

not to growth inward, but to the pressure brought to bear upon the enlarged gland by the muscles' passing over its surface.

On the other hand, a relatively-small enlargement of the gland may, by pressure, bring about a very considerable disturbance; much depends upon the exact position of the growth.

[Thus, only recently, at an autopsy upon the body of a woman who had for some years past suffered from occasional paroxysms supposed to be asthmatic, and who died almost suddenly from extreme dyspnœa, I found that all the trouble was due to a localized enlargement of the isthmus of the gland, an enlargement which from the general stoutness of the woman had not been recognized during life. Dr. Anderson, of Toronto, recently exhibited, at a meeting of the Ontario Medical Association, a very similar case. J. GEORGE ADAMI.]

As might be expected from its position, it is in connection with the trachea that most often the first symptoms arise, pressure upon this leading to some embarrassment in respiration. The paroxysms of dyspnœa, which not infrequently occur, are ascribed to the catarrhal condition of the mucosa secondary to the pressure; but in some cases it would seem to me that the paroxysms are directly due to the pressure and connected with sudden enlargement of the organ, either through hyperæmia or, again, through hæmorrhage into the organ.

Case of wandering thyroid. It arose from the right lobe, lay behind the sternum, and caused paralysis of the right vocal cord by pressure on the right recurrent laryngeal nerve. The tumor could be brought above the sternum by coughing. Reuter (Deutsche med. Woch., July 23, '91).

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A person who has goitre, but who has not suffered from dyspnœa at all or who

has only suffered moderately, may have a sudden attack which may be fatal. A very few cases have been caused by hæmorrhage into the goitre; but this condition is excessively rare. The theory of Rose is that the pressure of the enlarged thyroid makes the tracheal rings non-resistant, so that the trachea is apt to be bent and its lumen become obstructed. He thinks that in these cases of sudden dyspnœa the trachea becomes kinked from relaxation of the muscles, which maintain the head in such a position as to keep the tube open, and that this is probably brought about either during sleep or anæsthesia. These cases do not occur always during sleep or anæsthesia. Very urgent dyspnœa is rarely brought on by the relaxation of the muscles during sleep, for if the position of the neck were the cause of the dyspnœa alternation of the position should relieve it, yet this is not the case. Charles A. Morton (Bristol Med.-Chir. Jour., Sept., '96).

Where there is gradual compression upon the trachea, it is in general lateral, and it may be so extreme that the side-walls are pressed together and a triangular or even flat-sided tube be produced.

The alteration in the voice not infrequently met with in the goitrous is to be ascribed in different cases to two different causes: (1) to actual pressure upon the cricoid and thyroid cartilages, causing impediment in their proper action; and (2) to compression of the recurrent laryngeal nerves. There may also be pressure upon the phrenic and sympathetic nerves.

By the very size of the organ obstruction may be brought about in the veins of the neck and upper half of the chest, leading to chronic congestion of the upper portion of the body, so that the skin assumes a dusky appearance. It has been noted by several authorities that in general the jugular veins are dragged inward, while the carotids are dislocated outward.

Rarely the parts supplied by the brachial plexus of nerves show the result of pressure upon that plexus, and we meet with paralysis of certain muscles of the arm, numbness of the fingers and other portions of the upper extremities. Such disturbances occur in growths of large size tending to spread downward beneath the clavicle and sternum.

It is rather remarkable that there is rarely any description of disturbances of deglutition; it would seem that, where there are large growths in the neck, the œsophagus easily adjusts itself to one or other side.

Apart from these symptoms due to local pressure, there are other symptoms which have been too much neglected, to be made out more especially in younger women, and of the same class as the psychoses seen in exophthalmic goitre. There may be no palpitation nor tachycardia and no exophthalmos, but, as Dr. Shepherd has pointed out to me in connection with the numerous cases occurring in the neighborhood of Montreal, very frequently the patients are of a nervous disposition, fearful, and unable to settle down to sustained work; tremors are very rarely observed. An interesting fact, however, is to be made out: that, upon enucleation of the cysts or enlarged adenomatous masses in the gland, the nervous condition almost immediately becomes so much improved that evidently these symptoms are allied to those of hyperthyroidism and exophthalmic goitre.

Subjects of goitre become insane about nine times as frequently as normal subjects. The degenerative and puerperal forms of insanity predominate in goitrous cases. Goitrous patients, with curable forms of insanity, recover as frequently as do non-goitrous; nor is there any special difference in the duration of the disease. The thyroid gland, they conclude, has a direct action upon the cen-

tral nervous system. Marzocchi and Antonini (*Revue of Insanity and Nervous Dis.*, June, '92).

Still more rare, though occasionally recorded in those especially of middle life, is the supervention of symptoms pointing to atrophy of the gland-tissue and the definite development of myxœdema. The heavy appearance and disposition of many middle-aged goitrous subjects is very probably due to relative incompetency of the thyroid. It must be kept in mind that such symptoms of disturbed function of the gland deserve to be carefully sought out and recorded, for up to the present time little or nothing has been systematically accomplished either to distinguish the functional disturbances brought about by one or other form of "ordinary" goitre or to co-ordinate the symptomatology of ordinary and exophthalmic goitre.

Diagnosis.—If we leave out of account the enlargement of accessory thyroid bodies, the diagnosis of goitre (apart from that of the various forms of this condition) is a relatively simple matter, and from the position of the thyroid and the ease with which it can be palpated there is little likelihood of mistaking the persistent enlargement of this organ for any other condition. Where accessory thyroids are enlarged, it is practically impossible to arrive at an exact conclusion as to the nature of the enlargement, unless, indeed, this takes on the character of malignancy, and then the evidence of secondary growth affecting the bones, recognizable in some rare cases, would give a certain amount of support to the belief that the primary growth in the neck region originated in the thyroid tissue.

Between the forms of goitre, save as between benign and malignant, up to the present time very little stress has been laid upon differential diagnosis. If, in

the first place, the whole of the lobe or the gland be uniformly enlarged, it is necessary to differentiate between the vascular and general hyperplastic goitres and the condition of acute suppurative interstitial thyroiditis. This last condition is rare, and the evidence of sepsis alone and the local evidence of inflammation will distinguish this from other forms.

Vascular goitre is characterized by the fact that pressure upon the organ leads to marked diminution in its size, the organ soon returning to its former dimensions after the pressure has been removed. In its slighter conditions simple hyperæmia of the gland leads merely to the rounding of the neck. In the very rare condition of struma aneurismatica there is marked pulsation, and upon auscultation arterial murmurs are to be made out.

GOITRE.	AERIAL TUMOR.
Not affected in volume by respiration.	Changes in volume: increases with expiration, cough, etc.; diminishes in deep inspiration and forced extension of the head.
More or less firmness.	None.
Bi- or tri-lobed, sometimes with prominences or large vessels on surface.	No such appearances.
Does not disappear on compression.	Disappears on compression.
No alteration in voice.	Frequent modification of voice.
Dullness.	Resonance on percussion.

Puncture will aid in diagnosis, a jet of air showing the nature of the malady. Aneurismal goitres are at times reducible a third or two-thirds, but not more. L. R. Petit (*Revue de Chir.*, Feb., Mar., May, June, '89).

With general hyperplasia there is absence of all these features, the organ is generally firm and enlarged, and there is a history of gradual development. Where the enlargement is of the colloid or gelatinous type certain observers ascribe to it a more doughy feel.

In the nodular forms of benign goitre it must be remembered that in a very large number of cases we have to deal with quite a series of different conditions. Some of the nodules may be firm and

fibroid, others again, of various sizes, may present purely parenchymatous changes either of the colloid or of the adenomatous type, while, further, here and there throughout the gland some of the larger rounded nodules may present more or less evidence of fluctuation and, in short, may be cystic. Where such cysts are present, it may be laid down that we have always the indication of a previous and existing condition of parenchymatous hyperplasia or adenoma at the region where the cyst has developed.

Following points noted in diagnosis of a polycystic tumor of the thyroid: The rounded form, not at all recalling that of the thyroid in its normal state; the tendency to ascend, whereas hypertrophied lobes of the thyroid tend to descend. To assure one's self of its connection or otherwise with the trachea, the head is extended as far as possible to immobilize the larynx and trachea. A movement is then made to raise the tumor. If even a slight displacement takes place the tumor is enucleable without the trachea's coming into great danger. Sometimes, however, the trachea is so softened that several rings can be dragged with the tumor, so that caution is necessary. Tillaux (*Revue Gén. de Clin. et de Thérap.*, Sept. 26, '88).

As between the benign and malignant goitres, the main point of distinction is the rapid progressive growth of the latter form. But, here, warning must be given that hæmorrhage into a goitre—a not infrequent occurrence—may lead to rapid localized enlargement. Such enlargement, however, is of sudden development, and after its first appearance it remains stationary: it is not progressive.

Malignant tumors of the thyroid, though rare, are more common in men than in women, and usually develop from pre-existing goitres. R. N. Wolfenden (*Med. Press and Circular*, Dec. 12, '88).

Case of a man with a tumor of the neck of five years' standing. It was soft,

solid, slightly lobulated, and occupied the whole space between the sternum and the thyroid cartilage. A parenchymatous goitre was diagnosed, but, on removal, the growth was found to be a fatty tumor, adherent to the anterior wall of the trachea. Alex. F. Matveieff (*Brit. Med. Jour.*, Sept. 12, '91).

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Case of woman who has had a tumor in the neck for a number of years. It has gradually increased in size. It is hard, dense, lobulated, and apparently fixed, although it is not adherent to the skin. The patient has a peculiar strident croupy cough, labored respiration, and swallows with some difficulty. Enucleation was performed. The patient recovered promptly after the operation. The tumor was a sarcoma of the thyroid. George F. Shears (*Clinique*, June 13, '98).

As between the cancerous and the sarcomatous goitres the distinction has been made that carcinoma tends to affect the surrounding lymph-glands and is peculiarly liable to have associated with it metastases in the bones, whereas sarcoma of the thyroid undergoes more local extension with a tendency to invade and ulcerate into the trachea, as again to infiltrate the skin and cause extensive malignant ulceration of the neck.

In some rare cases, it should be mentioned, where there is a localized goitrous enlargement confined to the isthmus, my experience would show that there is a danger of the condition's being overlooked. The same is true with regard to retro-oesophageal accessory goitres. Thus, in paroxysmal dyspnoea affecting more especially females, any possibility of such localized enlargement should be borne in mind.

Etiology.—We are as yet wholly ignorant as to what is the immediate cause of ordinary parenchymatous goitre, and, while very numerous apparently predis-

posing causes have been adduced, not one of these, so far as I can see, can be said to be in action in every case. Indeed, at the present time too little care has been taken to distinguish between the various forms of goitre and to determine whether the sporadic cases are anatomically of the same character as those met with in regions where the condition is endemic. It is, in fact, the existence of these sporadic cases which, to a large extent, renders it difficult to determine the etiology of the condition. Certain conclusions can, however, be gained from a study of these predisposing causes:—

In regions where goitre is endemic—and it has been noticed both in Europe and on this continent (Michigan,—Dock; Ontario,—Clark, quoted by Osler)—the domestic animals, dogs and horses, also present the condition.

Goitre occurs in all parts of Michigan. It is most prevalent in the northern part. Fifty-two reporters give a total of four hundred and seventy-seven cases. Lower animals almost always have goitre where it is common to man. George Dock (Boston Med. and Surg. Jour., July 4, '95).

No race appears to be exempt; the condition has been found in all parts of the world, affecting all peoples. In America Munson has recently studied the prevalence of goitre among the Indians of the United States, and finds that the Crows, the Menoninees, and the Northern Cheyennes are particularly liable. At the same time among these tribes the disease is regional.

Of 147,873 Indians included in those reported on, 77,173 were inhabitants of goitrous tracts, in whom 1823 cases of bronchocele were found, or 2.36 per cent. This may be considered a minimum percentage, and the following conclusions are arrived at from the facts quoted:—

1. There is a strong racial disposition to goitre among the Indians.

2. It is a distinctly localized disease.

3. It does not appear to be caused by high altitudes, climate, or water containing excess of calcium-salts.

4. It is favored by unsanitary conditions, constitutional depression, and improper and excessively nitrogenous diet.

5. Hereditary influence is strongly marked.

6. Sex and puberty have a marked influence.

7. Cretinism, and Graves's disease are rare; the former the rarer.

8. The tumors are smaller than among the whites, and treatment is unsatisfactory. E. L. Munson (N. Y. Med. Jour., Oct. 26, '95).

There can be no question that goitre manifests itself much more frequently and in general attains to a much greater size in the female than in the male. Statistics upon this point are very variable; St. Sager gives the proportions of 44 to 1; but this would appear to be excessive in most localities. Fischer has collected statistics showing that from 80 to 90 per cent. of all cases of goitre—and of cases of myxoedema, 86 per cent.—occur in women, while exophthalmic goitre seems to attack the same sex chiefly.

As above stated, the condition may be congenital. In the absence of clear evidence that a goitrous mother living in a non-goitrous region may give birth to children showing an already-developed goitrous condition, I am doubtful whether the condition can be truly said to be hereditary.

In 117 families in which one or more members suffered from goitre, all patients observed living in the town of Hamar and its environs, where the disease is frequently met with without being endemic, the disease had most frequently commenced in childhood, and rarely after the age of forty.

In 74 of the 117 families several members suffered from goitre, and in 48 of these the disease appeared in the direct ascending or descending line, while it appeared only in the lateral branches

in but 26 cases. Hemierania, and this only in its typical form, was a symptom very frequently met with—both in the patients with goitre and in their relations with no goitre. Goitre considered as being of vasomotor origin. Vetlesen ("Etiological Researches Concerning Goitre," '87).

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Seven cases of goitre observed in the same family. L. F. Mial (*Jour. of Laryng.*, Mar., '96).

Kocher, who regards goitre as the first stage on the road leading to cretinism, holds similar views with regard to the congenital as opposed to the inherited nature of that disease.

As already stated, there appears to be a very close relationship between disorders of the thyroid and the sexual functions. We are as yet wholly ignorant as to what is the nature of this relationship.

It is suggestive to note that, as pointed out by Gaskell in his address in the Physiological Section at the meeting of the British Medical Association in Liverpool in 1896, in forms which may be regarded as occurring along the line of vertebrate ancestry, the primal sexual organs lie in immediate connection with the laryngeal depression or groove from which the thyroid is developed; indeed the thyroid in these is a sexual organ. Certain it is that the thyroid is liable to show marked enlargement at the time of puberty, during menstruation, and during the period of child-bearing, and, again, that a very large number of cases of goitre are traced back, both in man and woman, to the time of puberty or of other marked disturbance in the sexual organs. The slighter sexual disturbances of the thyroid are apparently of the nature of an hyperæmia. This hyperæmic condition if continued would seem to lead to more extensive parenchymatous changes.

Thyroid enlargement is very frequent in women who have uterine fibromyoma. In 56 cases of a gynecological affection with enlarged thyroid, 44 times the for-

mer was a fibromyoma. Freund (*Gaz. Méd. de Paris*, Oct. 10, '91).

Two cases in which hypertrophy of the spleen coincided with an increased volume of the thyroid gland. The functions of the spleen were destroyed by disease. The hypertrophy of the thyroid is in relation with the abolition of the function of the spleen. Cardone (*Archivii Italiani di Laringologia*, Pt. 4, '88).

In a case of sarcoma of the thyroid, in which tracheotomy failed to relieve dyspnœa, caused by pressure on the pneumogastrics, irritation of the mucous membrane of the trachea gave temporary relief. J. Solis-Cohen (*N. Y. Med. Jour.*, Aug. 10, '88).

Case of supposed goitre which was found to be a great hypertrophy of both sterno-mastoid muscles resulting from extreme dyspnœa, due to a post-manubrial tumor (probably enlarged glands) pressing on the bifurcation of the trachea. A. Foxwell (*Brit. Med. Jour.*, Apr. 18, '91).

Goitre, common in a certain district, ascribed to increased blood-supply to the thyroid, due to the exertion consequent on carrying water in vessels upon the head. Thomas A. Glover (*Brit. Med. Jour.*, July 13, '95).

In Switzerland Kocher finds, in studying no less than 76,000 school-children, that before the seventh and eighth years goitre is an exception, the condition increasing in frequency up to the thirteenth and fourteenth years.

It is equally clear that goitre in general is endemic and that the vast majority of cases occur in certain well-defined areas. More especially is the condition found in mountainous regions, but not all; for example, it is not found in the Jurassic regions, or, again, according to Bircher, where the rocks are of fresh-water formation. Bircher's map of the distribution of goitre in middle Europe shows this relationship to mountainous districts very clearly, but shows, also, that the presence of high mountains and

deep valleys is far from necessary for the development of endemic goitre. Frequent cases are found in the flat country stretching from the north of Paris toward Belgium and along the valley of the Thames. On this continent Michigan and the Island of Montreal, where cases are very frequent, are in general flat and low-lying districts, nor is the goitrous area in Ontario mountainous. Dock points out that in America goitres are found as well with drift as on the Laurentian and many intermediate formations.

In certain provinces of Bolivia the Indians suffer much from goitre. These same Indians are clay-eaters; the clay is composed of silica, alumina, lime, magnesia, protoxides of iron and manganese, potash, water, and organic matter. Albert S. Ashmead (*N. Y. Med. Jour.*, Aug. 24, '95).

Numerous authorities have attempted to show that the composition of the water ordinarily drunk bears a direct relationship to the development of goitre. But here again the evidence is very conflicting. It may be briefly stated that the presence or absence of chalk or of magnesia or iron and other mineral constituents, the carrying of heavy loads upon the head, intermarriage and several other factors due to surroundings and habits of life, must all be given up as possible factors in the causation of this disease. Yet there can be little doubt that the water consumed is an important factor. In Switzerland Kocher found that in the affected districts competent inhabitants are able to point out fountains whose water without exception has caused goitre in children who drank it, while families which had a private water-supply were free from the affection. In one village, too, he was able to distinguish those who drank from one supply from those who obtained their water

from another by the existence or non-existence of goitre.

The following conditions accompany the production of goitre: (1) absence of hygienic care, material and intellectual poverty; (2) age—12 to 15 years; (3) presence in the water of notable quantities of lime and magnesia (not absolutely general); (4) altitude; (5) carrying large burdens causing bending of the head, and bending of the head during work; (6) acute phenomena which seem to indicate an infectious origin. Venous stasis is a predisposing and infection a determining cause (existing in the waters or air of certain countries). The infection may run an acute course. Froelich (*Revue Méd. de l'Est*, Nov. 15, '91).

Goitre in England is most prevalent in the carboniferous lime-stone regions. James Berry (*Brit. Med. Jour.*, June 13, 20, 27, '91).

In a district having a population of about two thousand, the writer has had fifty-five cases of goitre under his care in the past two and one-half years. The soil of the district is excessively chalky, and, with few exceptions, the water-supply is obtained from deep wells sunk into the chalk. When the springs are low the water is drawn up and even consumed while still milky in color. The people who live on the tops of the hills and who drink stored rain-water are not affected with the disease. H. C. L. Morris (*Brit. Med. Jour.*, July 6, '95).

In the hills of Cumberland and Westmoreland, where goitre is endemic, iron, copper, and lead are found in large quantities. Paracelsus and other physicians of the sixteenth and seventeenth centuries accused metallic waters of causing the neck to swell, and even mention iron pyrites as a cause of goitre. Louis E. Stevenson (*Lancet*, Dec. 14, '95).

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More than 76,000 school-children between the ages of 7 and 16 reviewed with their parentage and antecedents. The investigations were principally made in the Canton of Berne, Switzerland. The formulated results may be briefly stated as follows: The female is more

frequently the victim of goitre than the male. In children between the ages of 9 and 14 years goitre reaches its highest degree of frequency, and rarely appears before they are sent to school, where the position of the head in writing and reading gives a tendency to the ailment. There is, therefore, a school-goitre. The secondary changes in the thyroid are proportionate to the advanced age of the subject. Congenital goitre is extremely rare. A still greater exception is congenital atrophy of the thyroid. The districts supplied with water from the fresh-water sandstone showed a prevalence of goitre, while in the districts in which the water originated from salt-water sandstone goitre was infrequent. The prevalence of goitre depended upon the abundance of organic elements in the water rather than upon its source, and that neither deficient nourishment, unhealthy dwellings, nor wretchedness and poverty is a direct causation. Often the districts rich in goitre are separated by narrow limits from those free from the disease and in goitre-laden localities were oases free from goitre. There were actual goitre-fountains, the water of which almost invariably produced goitre in the children that drank it. On the other hand, in localities where goitre was prevalent families who had a private water-supply were sometimes free from infection. Brooks and rivers and long open conductors of water were unfavorable. Kocher (Correspondent of Boston Med. and Surg. Jour., June 24, '97).

Study of causation of goitre in a district in India 2000 feet above sea-level. Strong evidence pointing to an organic rather than a mineral cause. The soil is extremely porous. The water contains no more than a moderate amount of organic matter and mineral constituents. is soft or moderately hard, and, except for minute traces, is free from iron.

The inhabitants, who live under the same climatic conditions, but with different occupations, may be divided into two classes: the native Bhutias and the Sepoy troops from the northwest provinces. The former are omnivorous, but, by reason of poverty, mostly vegetarians. Their chief diseases are goitre, syphilis,

and malaria. The temporary inhabitants, the Sepoys, are all vegetarians, and are healthy, practically free from syphilis, and living under excellent hygienic conditions. Examination of 169 Bhutias showed that over 75 per cent. had goitre; nearly 90 per cent. of those over twelve years of age were afflicted. Of 380 Sepoys examined, 54 per cent. had goitre. The Bhutias say that their goitres increase during the rainy season. All the British officers, also, during the preceding rainy season had suffered from enlarged thyroids.

Iron is present in the water only in very minute quantities. As to lime as a cause, it appears that many of the Bhutias without goitres are great lime-eaters, while of the Sepoys, who never touch it, over 50 per cent. had developed goitres within twenty months after arrival. The theory that the disease is due to carrying heavy loads up and down hills might satisfy in the case of the Bhutias, but not in that of the Sepoys, who, though not carriers, yet have goitre. Fifty-five per cent. of children under twelve had no goitres after living there always, or about the same percentage as did develop them among the Sepoys after a visit of only twenty months. E. E. Waters (Brit. Med. Jour., Sept. 11, '97).

More recently, Klebs, Kocher, Waters, and others have attempted to find a microbic causation for the disease. Thus, Kocher points out that goitre-water differs from free water in containing many more micro-organisms. And Waters contends that there may be micro-organisms of the amoeba type resembling the malarial organisms with a selective power for the thyroid and its secretions.

Tavel, working for the Swiss Committee of Twenty-five Physicians, and comparing waters which were found to induce goitre with goitre-free waters, found that, while both were, upon chemical analysis, pure, the former contained numerous microbes. One form common to two goitrous waters inoculated into

guinea-pigs resulted in the hypertrophy of the thyroid, but the same form had no effect upon dogs. Attractive as this theory may seem, however, in the absence of any other satisfactory explanation, two facts seem to be strongly opposed to it:—

1. That goitre affects females so greatly in excess of males.

2. That the disease, at least in its early stages, may be arrested and, indeed, cured by the removal of the patient from a goitrous to a goitrous-free district.

If microbes play any part in inducing goitre it would seem from these considerations that they do not directly infect the organism, but by their products of growth, contained in the water in which they grow, they must induce a form of intoxication capable of affecting the female rather than the male. It will be seen that the whole subject of etiology is thus still in a very vague state.

The drinking-water carries the harmful agent. "Goitre-water differs from goitre-free water in containing many more micro-organisms." Theodor Kocher (*Wiener med. Woch.*, Aug. 15, '91).

Case of thyroiditis of spontaneous development. The gland was not enlarged prior to the attack, although it had formerly been considerably hypertrophied. Bacteriological examination of the pus, withdrawn under strict antiseptic precautions, revealed the presence of pneumococci. It is the first case of the kind on record. Gérard-Marchand (*Le Bull. Méd.*, June 21, '91).

Cases of metastatic thyroiditis operated on by Kummer and examined bacteriologically by Tavel. In the first the goitre had existed for fourteen years. The patient was attacked with diarrhoea and fever; two days later, severe pains in right side of neck. The thyroid became inflamed and respiration was impeded. Right half of the thyroid removed, which was found to contain two cysts.—one colloid, the other inflamed. The latter was found to contain the typhoid bacil-

lus (of Eberth). This established the nature of the original disease. The second case was one of post-puerperal thyroiditis. In the pus were numerous streptococci which had, doubtless, invaded the organism at the time of labor. Both cases recovered. Nicaise (*La Semaine Méd.*, May 27, '91).

Case of a young man who had a goitre which had given him very little trouble. After an attack of typhoid fever an abscess formed in the gland, which was opened aseptically. A microscopical examination and a culture showed the presence of the typhoid bacillus in a pure state. F. Colzi (*La Semaine Méd.*, Aug. 19, '91).

Observations in the valley of Aosta, where goitre is endemic. Conclusions: (1) all the examinations of water used for drinking purposes by the subjects of endemic goitre revealed the presence of numerous bacteria; (2) the constant presence, in variable quantity, of a bacillus which liquefies gelatin, and has special morphological and biological characters; (3) this water, given to horses and dogs in a district exempt from goitre, produced an enlargement of the thyroid; (4) it is not yet proved that elimination of the microbes destroys the power of the water to cause goitre. Lustig and Carle (*Med. Bull.*, July, '91).

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The disease believed to be due to an organism of an ameba type, and resembling the malarial-organism, with a selective power for the thyroid or its secretion. For a time the system opposes it, and sometimes successfully, but, when it overpowers the phagocytic resources of the system, the thyroid enlarges in the effort to combat the poison. Under thyroid feeding (two 5-grain tabloids daily) the records show a weekly diminution of a quarter to half an inch in the circumference of the Sepoys' necks, and when the treatment ceases the gland again increases in size. That is to say, additional resisting power is administered in the shape of thyroid tabloids, which keep the poison in check and allow the gland to recover its normal size, but on withdrawing the accessory agent

there is diminished resistance and again an increase in size. E. E. Waters (Brit. Med. Jour., Sept. 11, '97).

The only two predisposing factors that stand out at the present moment as likely to be predisposing are, indeed, alterations in the sexual function and the nature of the drinking-water. Attempts have been made, both in the Pyrenees and again in Michigan, to cure or arrest the onset of the condition by boiling or filtering the water. Kocher recommends the same. So far adequate evidence as to the effect of these measures is lacking.

Pathology. — To discuss at all adequately the pathology of goitre, the minute anatomical differences between the various forms of goitre alone would take up far too much space. But there are certain points which must always be kept in mind. The first of these is the remarkable vascularity of the normal thyroid. As Councilman has pointed out, the size of the thyroid arteries is larger than that of those going to the brain. This, in itself, indicates that the blood-supply must be relatively enormous, and that the functions of the gland must be relatively very important to the economy. The second is with regard to the nature of the secretion into the vesicles. The evidence at present before us would appear to show a close relationship between the lymphatics and the cavities of these vesicles. What that relationship is has not been adequately proved, but it would seem that the colloid material is formed by an inspissation and possibly a modification of the excretion from the epithelial cells lining the vesicles; and inasmuch as numerous observers have pointed out the presence of similar colloid material in the lymphatics in the immediate neighborhood of the vesicles, it is very possible that normally the lymphatics carry away the material elab-

orated by the cells. That this material is of importance to the organism has been abundantly demonstrated in the last few years by the researches of Baumann and Robert Hutchinson. The latter has conclusively proved that the albuminous colloid material carries or contains what may be termed the active principle of the gland, and that, if this colloid material thus isolated be given to myxœdematous patients, it has all the good effects of the full extract of the gland. And he has shown that combined with it there is iodine; in fact, that Baumann's thyroiodine obtained from the whole gland is evidently the active albuminous substance in this secretion.

Primarily, the parenchymatous goitre would seem to be an overgrowth of the gland with overactivity, although such overgrowth may eventually give place to atrophy and inactivity of the specific glandular substance. It is very suggestive that, in a large proportion of cases where the goitre is not of too long development and is of the parenchymatous type, the iodine treatment has for long years been found to give good results. We are, in short, only just now seeing the beginning of a knowledge of the relationship of parenchymatous disturbances in the thyroid to disturbances of the general body-metabolism, and at the present we can do little more than carefully note the nature of the anatomical changes of the organ, without being in any way sure of their bearing.

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In a study of the histology of the vascular system of thyroid in goitre the author has examined twenty-eight glands taken from subjects varying in age from a fœtus of the fourth month to an adult of 68 years. Death in these cases was due to a variety of causes. In glands containing goitrous nodules ar-

teries were found in which there were well-marked proliferations of the endothelium in localized areas, forming bud-like projections. In one specimen these proliferations frequently occluded the artery. The groups of cells forming these buds may cause little or no projection of the intima, but may develop outwardly at the expense of the muscular coat. The size of the buds varies much within certain limits.

As buds have been found containing colloid, they would seem to have the power of producing this material. The larger arteries are almost or altogether free from these changes. R. M. Horne (*Lancet*, Nov. 26, '92).

Goitre-formation apparently begins by a growth of processes of the normal glandular epithelium. The first clearly-visible beginning of the nodular goitre consists of single processes of differentiated epithelium in the secondary lobules. These processes gradually supplant, metaplastically, the normal tissue of a secondary or even a primary lobule. The lobules thus changed form, as they increase in volume and supersede the surrounding tissue, the smallest true goitrous nodules. Neighboring lobules changed in this way form multilobular goitrous nodules, either blending by a growth through the intervening septa or flattening where they come in contact. Finally, the outer compressed lobules surround the central, more vigorously growing ones like a shell. The metaplastic growth ends when the boundary of the primarily-affected lobule is reached, growth then taking place by displacement of the surrounding tissue. Diffuse goitre consists of a uniform proliferation in all the lobules. Nodular goitre arises through a variation in the vitality of neighboring parts. There exist a great variety of intermediate forms. T. Hitzig (*Schmidt's Jahrbucher*, July, '94).

The most frequent fact observed in ten cases was the presence of fine granular matter in the follicles, and in such quantity that in some cases it surpassed that of the homogeneous colloid masses. These granulations are of the greatest importance in explaining the formation of colloid matter, for they form one of

the preliminary stages, and the progressive transformation from one to the other may often be seen in the same follicle. In this transformation there is not only a modification of density, but a change of color also. The origin of the granular matter is located in certain large round or oval elements, larger than the epithelial cells, with pale protoplasm, but formed by the same fine granular masses as the rest of the follicular contents which surround it. These are considered to be only modifications of epithelial cells. The special point of interest in this process is the complete absence of homogeneous drops, of irregular balls or masses, giving birth to colloid matter by their confluence. The formation of colloid substance in goitre should, therefore, be considered as a purely degenerative process. Reinbach (*Beiträge zur path. Anat.*, etc., B. 16, p. 596, '95).

Prognosis.—Upon the whole, save in malignant forms of the condition, the prognosis must be regarded as favorable. Even where no steps are taken to arrest the growth, it is a matter of common observation in goitrous districts that persons for long years may bear tumors of great size without pronounced ill effects. Occasionally, however, severe, not to say fatal, respiratory disturbances may supervene in those with comparatively-small goitres, either from hæmorrhage into the gland or from development of nodules in such a direction as to press on the trachea. Lucke has noted that occasionally after acute febrile disease a goitre may entirely disappear, and this vascular form, if of recent development, may spontaneously diminish in size.

Even where the goitre is of considerable duration, removal to a non-goitrous region may be followed by rapid diminution of the tumor, save where cysts are present; in young people and children such removal may, with fair certainty, be depended upon to cure the

state. Failing this, the medical treatment about to be described leads to marked improvement in the majority of cases. While, again, failing this, resort may be had to surgical means, and very little danger need be anticipated of any untoward result.

Treatment.—Treatment of the condition may be divided into medical and surgical.

MEDICAL.—The use of iodine and the various preparations of the same is quite the most valuable. According to Koenig, this drug is more especially of use in the hypertrophic and follicular forms, not so much in the colloid; especially in recently-developed goitre is it useful. It may be employed either externally over the goitre or in the form of potassium iodide given in large doses by the mouth. In this use there is some danger that the symptoms of iodism may supervene, but, as Koenig points out, we may not truly be dealing with iodism, but with symptoms of cardiac stimulation and rapid emaciation due to the rapid reabsorption of the colloid material into the blood.

Dangers of potassium iodide referred to in treatment of goitre. Goitrous subjects are particularly susceptible to iodism. M. Ferrand (*Le Progrès Méd.*, Nov. 23, '95).

Where cysts are present, iodine is useless and surgical means must be employed.

Mosetig-Moorhof has used injections of iodoform with slight constitutional reaction and excellent results, more especially in the soft varieties of goitre. Kapper, Frey, and Rosenberg all confirm the value of this method.

Soft varieties of goitre treated by author for the past ten years by injections of iodoform, with slight constitutional reaction and excellent results. The following solution was used under the strictest antiseptic precautions:—

R Iodoform, 1 part.
Ether, 5 parts.
Ol. olivæ, 9 parts.

Or

R Iodoform, 1 part.
Ether.
Ol. olivæ, of each, 7 parts.

Beginning injection is $15\frac{1}{2}$ minims; the author has injected as much as 62 minims at one time, injected in two places. Intervals should be five to eight days. Five to ten injections, according to the size, etc., of the tumor, are necessary for a cure. Mosetig-Moorhof (*Inter. Jour. of Surg.*, Mar., '90).

In 65 cases treated by the Mosetig-Moorhof method not the slightest bad symptom obtained. Good results noted in cystic and even fibrous goitres. Frey (*Wiener med. Presse*, Oct. 12, '90).

Fifteen cases of parenchymatous goitre treated with injections of iodoform after the Mosetig-Moorhof method with the most gratifying results. In one hundred and fifty injections there was not the slightest unpleasant symptom. F. Kapper (*Deutsche med. Woch.*, July 9, '91).

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The following solution, which should be kept in a glass-stoppered bottle, recommended:—

R Iodoform, 15 grains.
Ether, 105 grains.
Sterilized olive-oil, 105 grains.

The skin of the neck is carefully disinfected, a needle plunged into the goitre, and the injection made.

Half a syringe of may be injected at first, increasing gradually to an entire syringe. At first the injections should be practiced every fourth day; later, every second or third day.

The injections produce usually a slight sensation of burning, which ordinarily disappears in a few minutes, but sometimes persists for several hours.

Complete cure experienced in nearly 45 per cent. of cases, and decided improvement in about 50 per cent. Usually, at least twenty-five injections are required. Rosenberg (*Lyon Méd.*, Jan. 9, '98).

Another treatment which has of late years been tested with promising results in a certain proportion of cases is the administration of preparations of the thyroid gland. Issai, Vas, and Garg found that in three cases the use of thyroid tablets led to diminution in the size. Serapin confirms this observation. Stabel in twenty-six cases of goitre found that thyroid medication was beneficial. The best effects were obtained by the use of the fresh gland. Bad effects were noted in several instances from the use of the tablets, though Ewald came to contrary results, obtaining better results with the tablets than with the fresh gland. The parenchymatous form of goitre in young chlorotic girls was most benefited. Mendel obtained no improvement by use of tablets, and had to abandon treatment on account of the palpitation and emaciation which it caused. Perhaps the largest series of cases is that quoted by Angerer of 78 cases treated with raw gland. Only 4 or 5 remained uninfluenced. The hard fibrous growths remained totally unaffected, and, like other observers, he found that it is the small, soft, parenchymatous goitres, more especially in young people, that are most favorably influenced.

On the whole, therefore, the employment of fresh sheep's gland would seem to give the best results, and more especially in young persons and those suffering from the softer parenchymatous forms of the disease, whether diffuse or nodular. What the exact method is in which the thyroid taken leads to favorable results is a matter of doubt. To state that it causes physiological rest to the gland is, perhaps, begging the question. It is further to be noted that only in early cases does it appear to result in complete cure, and where cysts are present these are in no wise reduced in size,

although, through the shrinking of the surrounding tissue, they may become more easily enucleated. (See ANIMAL EXTRACTS.)

Twelve cases in which the thyroid-gland extract was used. In 5 cases observed in the hospital and in 5 outpatient cases a definite influence of the treatment could be observed; the goitres markedly decreased in size, but in no case disappeared. Nearly the same effect is obtained by the well-known iodine treatment. The experience of many years shows that nearly 90 per cent. of all the cases can be improved by the use of iodine; only in 10 per cent. does surgical treatment become necessary. The new treatment will probably have no great practical value in the treatment of goitre. Kocher (*Corres. f. Schweizer Aerzte*, No. 1, '95).

Administration of fresh thyroid gland or dry extracts of the gland to patients suffering with psychoses in association with parenchymatous goitre, while followed by pronounced diminution in the size of the enlarged gland, is unattended with any influence upon the mental state. On the other hand, the medication also occasioned no unpleasant effects. Reinhold (*Münch. med. Woch.* No. 52, p. 1205, '95).

Results of treatment of sixty cases of goitre with thyroid. Cases of benign parenchymatous goitre were put under treatment without any selection. Cystic cases and those of malignant disease were excluded, as were also cases of exophthalmic goitre. Instead of raw thyroid, tabloids were used in the dose of 2 daily to adults, 1 to children. Unpleasant symptoms, such as palpitation of the heart, nausea, diarrhoea, tremor, headache, etc., were treated by temporary withdrawal of the remedy. The duration of treatment was from three to four weeks on the average. In young children complete recovery was the rule. In older children marked diminution in the size of the goitre was observed, with cessation of symptoms. In adults recovery was rare and less common in proportion to age. Complete return of the

thyroid to its normal size is not to be expected later than the twentieth year.

Mild relapses were seen only three times, and in each case rapidly relieved by renewal of treatment. Bruns (*Amer. Jour. Med. Sci.*, May, '95).

Differences exist in different patients in respect to the effect of thyroid treatment upon metabolism. Albuminuria and glycosuria are regarded as unfortunate effects; the former is rare. Denning (*Münchener med. Woch.*, Apr. 23, '95).

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Thirty cases of goitre observed in which sheep's thymus was used, sometimes in its natural state and sometimes in the form of pastils of English manufacture. The thymus was administered in the form of hash spread on bread, in quantities of 150 grains for children and 225 grains for adults, three times a week. The effects of the treatment were ordinarily manifested at the end of three or four weeks, and the results remained the same when the treatment was continued for a longer time. Three patients, children 10 and 12 years of age, were completely cured anatomically. In 18 cases there was considerable amelioration, with diminution in the size of the tumor and in the symptoms provoked by it. In 10 cases the treatment failed completely. In none of the cases were toxic symptoms. The effects of the medication are particularly appreciable in diffuse, simple, hyperplastic goitre. Reinbach (*Mittheilungen aus der Grenzgebiete der Med. u. Chir.*, i, p. 202, '96).

The fresh glands selected with care and preserved on ice do not give rise to the toxic symptoms so frequently reported. In 25 cases of simple goitre of parenchymatous and fibrous character improvement was noted in 23, while in 2 the disease seemed completely arrested or cured. The treatment must, however, be continued to maintain the results obtained. Tablets of thyroïdin found considerably less advantageous than the fresh glands. Stabel (*Berl. klin. Woch.*, Feb. 3, '96).

Better results obtained with the tablets than with the fresh gland, the most

remarkable effects being observed in young chlorotic girls suffering from parenchymatous goitre. Complete recovery, however, did not take place, but slight symptoms of thyroidism, as moderate albuminuria with casts, noted, disappearing as soon as the treatment was suppressed. Ewald (*Univ. Med. Jour.*, Apr., '96).

Use of tablets noted in three very carefully observed cases; the conclusions are as follow: 1. The goitre has diminished in size. 2. The body-weight is diminished, the most marked result being obtained after long-continued use, and is in proportion to the amount of the gland-substance taken. 3. The amount of urine is increased. 4. The nitrogenous excretion in the urine is increased. 5. The balance of nitrogenous excretion is a negative one, *i.e.*, more is excreted than is taken in. 6. The uric-acid excretion is increased, especially during the first days of the treatment. 7. The excretion of sodium chloride and of phosphoric acid is increased. A. Issai, B. Vas, and G. Garg (*Deutsche med. Woch.*, No. 28, s. 439, '96).

No improvement obtained in ten cases in which tablets were tried. The treatment was abandoned on account of the palpitation and emaciation which it caused. Mendel (*Univ. Med. Jour.*, Apr., '96).

Under thyroid treatment the goitre diminishes in size, and may even sometimes return to its normal condition. When the treatment is carefully carried out and the effect watched, no complications occur. It has also a beneficial influence upon the nervous system. K. P. Serapin (*Wratch*, No. 5, Feb., '96).

One hundred patients treated with thyroid extract, 78 of whom suffered from goitre. The raw sheep's gland, finely minced, brought directly from the slaughter-house to the hospital by one of the attendants and there carefully examined, so that any diseased tissue may be at once detected and rejected, employed. Many of the toxic phenomena following its exhibition are due to early putrefaction. Of the 78 cases treated only 4 or 5 remained uninfluenced. A few showed such excessive reaction after

its use that it had to be discontinued. In the majority the goitre soon showed distinct signs of retrogression. Only the hard fibrous growths remained totally unaffected. In cystic goitres the substance of the gland atrophied around, while the cyst remained distended, but seemed to become more superficial, so that its subsequent enucleation was much more simple. The same result occurs in the adenomatous growths, the isolated tumor or knots coming to the surface and being much more distinct than formerly. It is the simple, soft goitres that are mainly influenced, and especially those occurring in young people. The bleeding in subsequent operations is much less than when thyroid extract had not previously been employed. One unfortunate result is produced, viz., a certain amount of heart-weakness, which becomes very marked during and after the administration of the anæsthetic. Relapses also sometimes occurred after the cessation of the thyroid treatment. O. Angerer (Münchener med. Woch., Jan. 28, '96).

In the tetanic condition toxins are found in the blood which are rendered innocuous by the antitoxin—"thyreo-antitoxin" of Frankel—which is formed in the gland-alveoli. In the myxœdematous condition, on the other hand, a poisonous proteid "thyroproteid" is formed in the tissues, passes into the blood, and is fixed by the thyroid. Here it is rendered innocuous by the action of an enzyme which splits it up into two parts,—a proteid constituent which unites with "thyro-iodine," and the other a carbohydrate. Notkin (Virchow's Archiv, Suppl., H., B. 144; Edinburgh Med. Jour., Mar., '97).

Iodothyrim used in four cases of goitre. The dose employed was $4\frac{1}{2}$ grains per day during extended periods, varying from one to three months.

In three of these cases, subjects from 12 to 18 years of age, who presented small recent fleshy goitres, which were accompanied by intense respiratory symptoms, the medication caused a rapid disappearance of the dyspnœa. After having been five months under treatment they are considered completely

cured. Poucet (Revista de Laring., Otol., y Rin., No. 11, '97).

Case of goitre cured in a newborn infant by submitting its wet-nurse, who also had a goitre, to the thyroid treatment. Every day during five days a tablet containing 22 grains of the gland was taken by the nurse; after an interval of five days the treatment was resumed, and so on until the treatment was discontinued. The infant's goitre disappeared after six weeks' treatment, that of the nurse became considerably smaller. Mosse (Brit. Med. Jour., Apr. 23, '98).

SURGICAL.—If, after treatment with iodine or with thyroid extract, no effect is produced, then operation becomes advisable.

Three months considered ample time for the exhibition of drugs, when, failing improvement, operation becomes advisable. Pressure on the trachea causing dyspnœa, and on the recurrent causing hoarseness, indicate early operation. John B. Roberts (Amer. Lancet, Feb., '95).

The surgical treatment of bronchocele has for many years been a subject of great interest, and to Kocher, Socin, and the Swiss surgeons much credit is due for the gradual development of successful methods of operation. As above indicated, it is more especially in the cystic forms that nowadays there is need to operate. Several methods have been suggested, the earlier being either incision of the cyst (Beck) or puncture, followed by injection of iodine.

Goitre the size of a hen's egg reduced to that of a small nut in nine months with one hundred injections of 5-per-cent. iodoformed ether. Terrier (Le Progrès Méd., Dec. 1, '88).

Referring to treatment by puncture and injection of iron, the substitution of rubber for metal cannule recommended on the third or fourth day, so as to do away with the risk of irritating the walls of the goitre. Thorton (Lancet, Feb. 18, '88).

Four cases of cystic goitre successfully

treated by evacuation and injection of a few drops of chromic acid in an "acid-carrier." E. Woakes (*Lancet*, June 21, '90).

Case in which a goitre had diminished one-third after injection of tincture of iodine twice a week for four months. The last injection was followed by convulsions and death, due probably to thrombosis. Sixteen cases of death after parenchymatous injections collected. Heymann (*Med. News*, Nov. 23, '89).

Interstitial injection of pure tincture of iodine is the most efficacious and least dangerous of all methods of treatment for ordinary cystic goitre. Schwartz (*Revue Gén. de Clin. et de Thérap.*, Mar. 23, '89).

Following directions given for the use of tincture-of-iodine injections: 1. Be sure that the needle is in the body of the tumor before injecting. 2. Avoid, as far as possible, the veins distributed in the cellular tissue over the tumor.

The syringe must be aseptic; it must be plunged slowly, but without hesitation, into the gland. The syringe must then be taken off to see that no blood flows from the needle. This precaution is necessary to avoid injecting into a vein. Inject very slowly; 8 minims is enough for the first injection. If this is well borne (*i.e.*, only slight pain with little swelling is caused), 15 minims can be used next time. One should wait a few seconds after making the injection before removing the cannula; only one injection to be made at a sitting, and an interval of four or five days to elapse before the next. There is considerable radiating pain for a short time after the injection, also a metallic taste in the mouth for a few hours. Tincture of iodine is the best substance for injection. Terrillon (*Bull. Gén. de Thérap.*, Sept. 30, '89).

Iodine injections should not be used on account of the danger connected with them, and on account of the periglandular adhesions which they cause. These adhesions afford especial difficulties in the event of a surgical operation's becoming necessary. G. Naumann (*Centralb. f. Chir.*, July 9, '92).

Injections of iodine are only efficacious

in recent parenchymatous goitres, but in these they are of great value. Brunet (*Archives Clin. de Bordeaux*, Feb., '95).

These methods are often followed by reaccumulation of fluid or hæmorrhage into the the cysts, and extirpation of the cyst as first suggested by Juillard and Kottman, now as modified by Socin into his method of enucleation, gives excellent results both in the case of cysts and in that of nodular parenchymatous growths.

In this country, Shepherd, following Socin's method, has had singularly good results in enucleating both cystic and nodular colloid growths. In the cystic forms he taps the cyst and evacuates some of the contents, and then the cyst-wall can be peeled off from the gland-tissue with the fingers or the raspatory much as an adherent ovarian cyst is peeled off from its surrounding structures. Should a vessel come to view, it is easily tied. Thus the operation is made one that is almost entirely external to the neck. It is remarkable how rapidly healing takes place after these operations, even when a huge cyst has been removed.

Case of cystic goitre treated by what the author terms "shelling out." An exploring needle having been introduced, it was ascertained to be a single cyst and to contain a reddish fluid. The cyst was "shelled out" without any difficulty through an incision about two and a half inches long over its most prominent part. The patient made a good recovery. Hæmorrhage is the chief source of danger in this operation. Vachell (*Bristol Medico-Chir. Jour.*, Dec., '87).

Conclusion, from results of operation in 77 cases of goitre, that intraglandular enucleation of one or several goitrous nodules is usually practicable, except in cases of malignant struma, diffuse parenchymatous or colloid hypertrophies of the gland, exophthalmic goitres, or goitres with numerous disseminated nodules.

The probability of recurrence is not greater than in partial extirpation. In no case were unfavorable results, as tetany or cachexia, observed, and in none of the cases of partial extirpation did the tissue left behind disappear. Bally (Med. News, June 13, '91).

Enucleation favored where it is possible. J. Boeckel (Gaz. Méd. de Strasbourg, June 1, '93).

In cases of diffuse enlargement of the whole gland such enucleation is, of course, out of the question, and while complete extirpation of the whole organ is now never dreamed of on account of the imminent danger of development of myxœdema, observers have with a greater or lesser success performed a partial extirpation either of a whole lobe or a portion of a lobe. Kocher especially has employed this method, and his results, both by enucleation and by extirpation, have been remarkable.

Results obtained in one thousand cases of goitre. Excluding the operations undertaken for malignant tumors and exophthalmic goitre only 3 patients had been lost out of 900 cases operated on during the last twelve years. One case of surgical myxœdema had resulted, and that was due to the fact that the half-gland that was left behind had become atrophic,—a point not noted until the removal was accomplished; the symptoms soon disappeared with the use of a sheep's thyroid. In the last 200 cases not a single patient was lost. Kocher (La Semaine Méd., Apr. 24, '95).

Indications for surgical interference in goitre are: (1) tracheal stridor; (2) dyspnœa; (3) dysphagia; (4) a rapidly-growing goitre, particularly downward; (5) deformity. As regards the last indication, the author thinks thyroidectomy of unilateral goitre justifiable if the patient is of suitable age and in good health and the deformity of the neck is greatly objectionable. J. B. Deaver (Jour. Amer. Med. Assoc., Aug. 8, '91).

Goitre remarkable for its extraordinary size extirpated. It was a cystic tumor reaching nearly to the umbilicus,

and its antero-posterior diameter was twice as great as that of the chest. Owing to the weight of the tumor the trachea was bent forward, the cervical spine was lordotic, and the thorax flattened. Thyroid vessels were tied before extirpation. Cure. Bruns (Deutsche med. Woch., Apr. 23, '91).

Shrinking of the portion of a goitre remaining after operation is a rule without exception. J. Wolff (Deutsche med. Woch., Dec. 31, '91).

Sudden death occurring during or immediately after the extirpation of a goitre may be due to asphyxia caused by a collection in the pharynx of mucus coming from the stomach. In one case the writer removed a quantity of this mucus from the pharynx, with immediate relief of the symptoms of suffocation. Wolff (Deutsche med. Woch., Mar. 16, '93).

Operated upon 202 cases of goitre. Of these 11 were malignant, 5 dying as a direct result of the operation. Of the 191 benign cases, nearly two-thirds were women. All cases showed more or less dyspnœa. Total extirpation was done 7 times; partial, 133 times; enucleation, 50 times (46 in cystic cases): intracapsular *évidement*, once. There were 9 deaths. Sudden death in cases of goitre is caused by suffocation due to sudden increase of the pressure of the goitre against the softened tracheal wall. R. U. Krönlein (Schmidt's Jahrbücher, Mar. 15, '93).

Interstitial injections condemned and surgical intervention advocated. In 292 cases operated upon the mortality was 1.36 per cent. Respiratory difficulties, impeded deglutition, and cardiac troubles regarded as indications for intervention. In 104 cases ablation by Kocher's method was practiced, and in 73 enucleation by Socin's procedure. Roux (Annales des Mal. de l'Orielle, du Larynx, du Nez, et du Pharynx, Sept., '95).

Tetany following thyroid extirpation is very dangerous. Of more than 30 cases following thyroidectomy recorded there were 7 cures, 13 deaths, and 3 cases in which the disease became chronic. In 53 total extirpations in Bill-

roth's clinic the affection appeared twelve times, of which 8 were fatal, 2 chronic, and 2 recoveries. Total extirpation to be avoided. In 115 partial extirpations in Billroth's clinic no case of tetany appeared. V. Eiselsberg (Schmidt's Jahrbücher, Apr. '90).

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Case in a woman, aged 33, who had a large tumor in the neck as long as she could remember. Latterly it had greatly increased. On two occasions it had been tapped. Tumor extended from the chin to the sternum in the middle line, laterally to points well behind the posterior margins of the sterno-mastoids, downward behind the sternum. The chin rested in a sulcus on the upper margin of the tumor. There had been some difficulty in swallowing. Removed under chloroform; the trachea was left bare, and a large cavity behind the upper margin of the sternum, in which the transverse arch of the aorta could easily be seen. Recovery. As the removal of the thyroid gland was apparently a complete one, thyroid extract in small quantities daily were ordered. Nine months afterward condition quite satisfactory. Sir William Stokes (Lancet, Jan. 4, '96).

Three hundred operations for goitre performed in the Tübingen clinic. The proportion of females to males is 2.5 to 1, and in the male sex goitre is apt to begin between the fourteenth and seventeenth years and in the female between the twelfth and sixteenth years. The majority of goitres occur in people who are obliged to perform hard, manual labor. The list contains only two cases of complete extirpation. The operation of choice has been intraglandular enucleation; but there are a number of examples given of extracapsular extirpation. These two methods may often be combined with advantage. Non-malignant goitre which is increasing rapidly in size ought to be operated upon, but one should never operate simply to relieve disfigurement. Bergeat (Annals of Surg., Mar., '97).

J. GEORGE ADAMI,
Montreal.

GOLD.—Metallic gold is not official in the U. S. P. Only one preparation is recognized: the chloride of gold and sodium (auri et sodii chloridi, U. S. P.), which is given in doses of $\frac{1}{30}$ to $\frac{1}{10}$ grain.

Twenty-seven cases of pulmonary tuberculosis treated with gold and sodium chloride, used hypodermically, in doses of $\frac{1}{30}$ grain to $\frac{1}{6}$ grain, during three to eight months, with gradual decrease of temperature and disappearance of cough and bacilli and increase in weight. Gibbs and Shurley (Ther. Gaz., Apr. 15, '91).

Case of phthisis apparently cured by the use of gold and sodium chloride. Pepper (Univ. Med. Mag., Dec., '95).

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The best vehicle with which to combine gold and sodium chloride in capsule is tragacanth or guaiac resina: neither of these decomposes it. The time for administration should be one hour after eating, or, better still, one hour before eating. The ideal method for administration is by hypodermic injection, the solution used being made with equal parts of aqua destillata and glycerina. Daniel R. Brower (Jour. Amer. Med. Assoc., Oct. 1, '98).

Gold is far more efficient than any other drug I know of in sclerosis. W. H. Walling (Med. and Surg. Reporter, Philadelphia, vol. lxxvi, '97).

Physiological Action.—The chloride of gold is a caustic irritant. In small medicinal doses the preparations of gold sharpen the appetite and promote digestion. If long continued, symptoms of overstimulation follow their use. Constipation is usually present. The mental functions become more active. Increased venereal desires are attributed to the use of gold. In men priapism is not uncommon. In women the menses are increased.

Poisoning by Gold.—The acute form

of poisoning follows the ingestion of a tonic dose and manifests itself by a violent gastro-enteritis, accompanied by cramps, convulsions, trembling, insomnia, priapism, and insensibility. In the chronic form, there develops a fever accompanied by sweating, a very abundant flow of urine, and salivation, without tenderness or ulceration of the gums. Epigastric heat and oppression, headache, dryness of mouth and throat, with gastrointestinal irritation.

Treatment of Acute Poisoning by Gold.

—The principles of treatment are the same as poisoning by corrosive sublimate. The contents of the stomach should be evacuated after the free administration of albumin, eggs, milk, and flour. External heat should be applied and stimulants administered by the mouth, the rectum, or by hypodermic injection. Morphine is useful if shock be present. Atropine will diminish the salivary secretion, and astringent (tannin) or dilute-acid mouth-washes will relieve the salivary symptoms.

Therapeutics. — The preparations of gold are not as much in favor as formerly. Nervous dyspepsia is relieved by small doses ($\frac{1}{60}$ to $\frac{1}{24}$ grain) given three times daily. Mills regards it as a valuable tonic in hysteria and other disorders dependent upon depravity of the nervous system.

NEPHRITIS.—In diseases of the internal organs associated with sclerosis, as nephritis, cirrhosis of the liver, etc., the persistent use of gold and sodium chloride has given excellent results. In contracted kidney a pill of chloride of gold has been recommended by Dana.

PHTHISIS.—Gibbs and Shurley, of Detroit, laboring under the impression that gold and sodium chloride possessed bactericidal powers in this disease reported

a number of cases in which satisfactory results were obtained.

SYPHILIS.—In old secondary and tertiary cases where mercurials and the iodides have been long in use, gold will yield beneficial results, as in gummata, syphilitic pharyngeal ulcerations, specific ozæna, etc. Ingals has found chloride valuable in syphilitic laryngitis. Hale White finds the sodium chloride preferable to corrosive sublimate in the tertiary form, especially when the osseous system is involved.

EFFUSIONS.—Gold has yielded good results in ascites due to chronic hepatitis, post-scarlatinal dropsy, and in ovarian dropsy.

GYNÆCOLOGICAL DISORDERS.—Amenorrhœa, sterility due to coldness, ovarian torpor, and the tendency to habitual abortion have been benefited by the use of chloride of gold.

MENTAL DISORDERS.—Good results have been obtained from the use of gold in melancholia and hypochondria accompanied by depression. Vertigo, when due to gastric disturbance, is often relieved by small doses of gold chloride, but when cerebral congestion or plethora is present, the use of gold is contra-indicated.

INEBRIETY.—Chloride of gold has been recommended in the treatment of chronic alcoholism (see ALCOHOLISM, volume i).

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Gold, whose effects are unknown and even to its defenders are surrounded by mystery, cannot possibly be of any service in checking an unknown disorder. Its use must be empiric and irrational always, except as a mental remedy to influence the mind. The checking of the drink symptom is the same as using opium for pain, leaving the cause uninfluenced. Gold or any single drug can have no specific influence in cases of in-

ebriety. T. D. Crothers (Jour. Amer. Med. Assoc., Oct. 1, '98).

C. SUMNER WITHERSTINE,
Philadelphia.

GONORRHŒA. See URETHRA, DISEASES OF.

GONORRHŒAL ARTHRITIS. See JOINTS, DISEASES OF.

GONORRHŒAL OPHTHALMIA. See CONJUNCTIVA, DISEASES OF.

GONORRHŒAL RHEUMATISM. See URETHRA, DISEASES OF; COMPLICATIONS.

GONORRHŒAL VAGINITIS. See VAGINA, DISEASES OF.

GOUT.

Synonyms.—Podagra; arthritis urica.

Definition.—Gout is a constitutional disease manifesting itself in various ways and attacking various tissues and parts of the body, but most frequently the articulations. It occurs in an acute and a chronic form, both of which are characterized by the deposit of urates in the affected parts.

Symptoms.—An attack of acute gout may occur without any precursory symptom in persons who, before, felt quite well; but this mode of development is not usual. Generally, premonitory signs are experienced some time in advance, especially in the digestive and circulatory system and in the kidneys. The patients have frequently led a luxurious life, have been accustomed to excessive consumption of food, especially of animal food, have indulged in alcoholic drinks, and taken little or no exercise. They are often obese, with red and flushed face, complain of heart-burn, sour eructations, flatulency, and other indications of a dyspeptic derangement.

[Another form of gout—poor gout—is met with in persons living badly and exposed to cold and dampness; these patients are ordinarily lean, with sallow faces. F. LEVISON.]

Immediately before an attack of acute gout the dyspeptic symptoms become aggravated; the bowels are obstinately confined; hæmorrhoidal pain and hæmorrhage is observed. The patients complain of headache, vertigo, drowsiness; sleep is disturbed by pain or cramps in the calves and elsewhere; there is pain in various articulations; paræsthetic sensations, such as numbness of the fingers, chilliness, etc.

Irregularity of the action of the heart is often observed and the pulse is ordinarily firm and tense; the morbid state of the nervous system manifests itself by mental depression, irritability, bad temper; severe neuralgia is a frequent precursory symptom, and severe pains of the lumbar region are frequently complained of. In spite of all these manifestations, the appetite is generally good and the venereal desire is frequently increased. The urine is in most cases concentrated and scanty; in others the micturition is free, acid, and abundant, the urine being clear and watery. Just before the attack all the precursory symptoms commonly disappear and a general sense of well-being may be experienced.

Although some of these precursory symptoms are observed in most cases, an attack of gout may well occur without warning; when the first attack sets in the patient may believe that he suffers from a sprain of the affected joint or that the pain is of rheumatic nature and only by repetition of the attack does the real nature of the disease become apparent.

In the majority of cases of acute gout the metatarsal phalangeal joint of the great toe is the articulation first attacked; generally on one side, but sometimes on

both; in subsequent attacks other articulations become involved either of the foot (podagra) or of the hand (chiragra). Almost all articulations may successively or simultaneously be affected, even the articulations of the jaw and of the spine; the hip-joint and the shoulder-blade are very rarely affected.

The attack itself has been vividly described by Scudamore, Sydenham, and other classics of gout: "The patient has gone to bed without any particular disturbance of health and often feels better than for some time; after some hours' sleep he is awakened, ordinarily between 12 and 3 o'clock, by a very intense pain in the great toe. The attack sometimes begins with a slight rigor. The pain soon increases to complete agony, there is much restlessness, and in vain some relief is sought by changing the position of the foot. The patient complains of extreme tension and throbbing in the affected joint; the pain, which has been compared to that caused by a tightly-drawn thumb-screw, is aggravated by the slightest touch or vibration, and becomes so intense that nothing at all like it occurs in any other joint-disease.

"After some hours of this excruciating pain, some relief is obtained, coming gradually or quite suddenly, perspiration occurs, and sleep follows. On the following day the affected joint is found swelled, red, tense, shining, and tender. Some pain continues all the day, and toward evening it becomes aggravated, reaching almost the same intensity as in the preceding night." The temperature is somewhat elevated; it reaches 102° F., but seldom higher; the pulse varies from 80 to 100.

For some days the symptoms may recur in the same manner, then some œdema appears around the affected joint, and successively increases to the

fourth or fifth day, when the pain finally commences to decline; the swelling of the affected joint then diminishes, and this is commonly followed by cracking and peeling off of the cuticle: a process accompanied by intense itching. When the great toe-joint or similar small articulations are affected no effusion in the joint can be felt; when larger articulations, such as the knee-joint, are attacked, this sign is frequently observed.

During the attack there is commonly thirst, but no appetite; the patient feels even aversion to solid food and some nausea; vomiting very rarely occurs; the tongue is furred and the bowels constipated, or there may be some pale and offensive stools. The urine is scanty, concentrated, and a copious sediment of urates and uric-acid crystals is precipitated.

When the attack has passed away, the patient often feels better than before it; some weakness, tenderness, and stiffness of the affected joint remains for some days, then complete recovery is established. The duration of the whole attack varies from six to ten days, and may even reach some weeks; in that case there are numerous remissions and exacerbations of the attack.

All attacks of acute gout do not, however, pass off suddenly; they may supervene gradually and increase in severity until they reach the true classical form. Sometimes the first attack is more violent, but as the malady progresses the accesses become more prolonged and are not so painful; at first the attack generally comes on once a year,—in the spring; then twice a year,—in spring and autumn; afterward at more irregular intervals. Only rarely does the malady show itself by one attack only; that may occur when the patient alters his whole manner of life, renounces the use of alcoholic

stimulants, lives on very frugal diet, etc.

As the attacks become more frequent, asthenia increases, the pain is less violent, the duration of the access is longer, the stiffness of the affected joints does not completely disappear, and they remain enlarged, red, and tender even after the attack has passed away; smaller or larger hard nodules (tophi) are found in the tissues around the joints and elsewhere,—the case is passing over in the chronic stage.

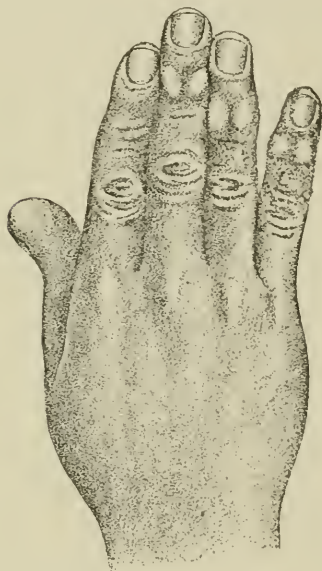


Fig. 1.—Gouty fingers. (Pfeiffer.)

As already stated, the first attack of acute gout ordinarily affects the metatarso-phalangeal articulation of the great toe; in some cases the knee or the elbow-joint is attacked at the onset. Garrod and other authors state that an injury, such as a sprain or a contusion, may determine the localization of the gouty process to the injured joint. Charcot observed that the articulations of paralyzed extremities were particularly liable to be involved by gout.

CHRONIC GOUT.—Chronic gout may occur as the result of a long series of acute attacks which gradually have weakened the constitution of the patient, or it may appear in feeble subjects as the only manifestation of gout. In both cases the joints successively get enlarged, deformed, stiff,—even immovable,—nodulated, owing to the deposition of urates in their structure. The skin covering them is congested and thin, with large, blue veins; ultimately it may rupture, and discharge whole chalky masses of urates,—tophi,—sometimes followed by suppuration and ulceration. The deformities of hand and foot are caused by partial dislocations of the phalanges, with deflection of the fingers in various directions; when the affected articulations are moved, a scraping sound is heard and felt. In the most advanced cases not only fingers and toes, but also wrist and elbow, ankle-joint, and knee are stiff and deformed, and at last the patient may be obliged to remain immovable in his chair or in his bed as an impotent cripple.

In chronic gout urates may be deposited in different structures, such as tendons (especially the tendo Achillis), bursæ, aponeuroses, and periosteum; in the cartilages tophi may be found, very frequently in the ear, but also in the eyelids and on the nose. These tophi are generally of the size of a pin's head or a bead; at first they contain a whitish fluid containing crystals of urate; ultimately they become solid and form small, hard nodules.

Two cases in which the nails of the big toes were more or less raised, through the increase of the epidermic cellular layer under the origin of the nail: their free edge was somewhat bent downward. The interior and posterior parts alone remained flat on their beds. At the same time an inspissation manifested itself

from the anterior end of the matrix to the free end. On scraping out some of the accumulated material it was found to contain crystals of urate of soda. Both patients were subject to plain attacks of the gout. G. Linden (*Pacific Rec. of Med. and Surg.*, Oct., '91).

Finger-nodes are divisible into two classes: In one class the nodosities are

Achillis. It is sometimes difficult to tell whether they are syphilitic or gouty in origin.

9. The indurations in the skin of the hands, which constitute the "Judson Bury" group. These occur with inherited gout.

10. The livid indurations in the skin which have been described in sarcoma

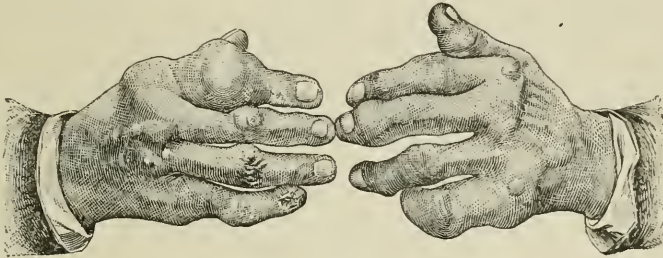


Fig. 2.—Gouty fingers. (*Pfeiffer.*)

true osseous enlargements, and are of rheumatic origin; in the other class the nodes are composed of urate-of-soda deposits and are connected with the true gouty diathesis. The outward appearances are illustrated by the accompanying cuts (Figs. 1 and 2), while the osseous enlargement of the ends of the bones in the rheumatoid cases is seen in Fig. 3. Emil Pfeiffer (*Lancet*, Apr. 11, '91).

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Varieties of nodules that may be met with:—

1. Non-calcareous nodules in the ears in the subjects of declared gout.

2. Fibroid thickenings and little lumps in the hands of those who suffer from gout.

3. Fibroid thickening of bursæ.

4. Gelatinous deposits, sometimes diffused and sometimes nodular. These are much softer than the fibroid variety.

5. The rheumatic nodules of Barlow.

6. The nodules met with in scleroderma. These are similar to the "rheumatic nodules," and possibly identical with them.

7. The lumps which often accompany Dupuytren's contraction of palmar fascia.

8. Lumps developed in tendons. These occur most frequently in the tendo

melanodes. These occur in adults with inherited or acquired gout. J. Hutchinson (*Hutchinson's Archives of Surg.*, Apr., '96).

In the skin tophi are more rarely found, but have been observed in the face. The urine in chronic gout is

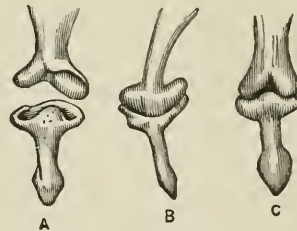


Fig. 3.—Osseous enlargement in gout. A represents the phalanges from the back, and B the side-view. For purposes of comparison a delineation is given of the dorsal surface of a normal phalangeal joint,—shown in C. (*Pfeiffer.*)

ordinarily pale and watery, sometimes slightly albuminous, and commonly abundant; it contains always casts of renal tubuli, hyaline or granulated. The patients are weak and pale, suffering

from disorders of digestion; they are subject to cramps, neuralgias, and other nervous disorders.

IRREGULAR GOUT.—Besides the symptoms directly dependent on or associated with the deposition of urates in the articulations and in other structures, many morbid symptoms have been observed in the course of gout and have more or less correctly been named symptoms of irregular gout; these symptoms may alternate with the regular attacks, and their gravity is frequently in inverse proportion to the violence of the true gouty attacks. Symptoms of irregular gout may occur,—an imperfect development of the attack, or suppressed gout,—or when inflammation of the joint from some cause or other (improper treatment) unduly subsides,—retrocedent gout.

Almost all internal organs may become the seat of disorders which have been ascribed to gout.

Case of obstinate gout in which, during the attack (the disease involved the penis), continuous priapism resulted, which lasted for twenty-one days. Pathology of the attack believed to be thrombosis in the corpora cavernosa. D. Duckworth (*Brit. Med. Jour.*, Jan. 16, '92).

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The absence of excessive heat in joints affected with gout and the fact that some observers have found such joints lower in temperature than surrounding parts, together with the early turgescence of the veins, the redness, and the pain, indicate that the cause of the attack is thrombosis of the vessels about the joints. Balfour (*Edinburgh Med. Jour.*, June, '98).

The gouty kidney presents the same signs as the ordinary granular-atrophic kidney, and cannot be distinguished from it, neither by the symptoms nor by the anatomical examination. It will be shown later on that a certain degree of

granular atrophy of the kidney is found in all cases of gout; when the renal changes are fully developed, the urine becomes clear and watery, contains urea and uric acid and in deficient quantity, and the patients may die from renal insufficiency. Gouty persons often suffer from gravel and calculosis; oxaluria is frequently met with; chronic cystitis and urethritis may be observed, especially in old persons suffering from gout.

In the direction of the nervous system many symptoms of morbid derangement may be observed, such as headache, hemiparesis, vertigo, fainting, sudden delirium, mental depression, epileptic fits, and apoplectic attacks. All kinds of neuralgia, especially gouty sciatica and costal neuralgia, have been described, and symptoms of disorders of the spinal cord and the meninges and paresis or paræsthesia at the peripheral nerves have also been noted.

The vascular disorders are generally caused by atheromatous changes of the large vessels and followed by hypertrophy and fatty degeneration of the heart. Severe palpitations, intermittent and irregular cardiac action, and weak, very slow or rapid pulse are frequent symptoms in gout. There may be dyspnoea and a feeling of constriction, and true attacks of angina pectoris are not uncommon. Phlebitis, especially of a recurrent form, has been observed among the symptoms of gout by competent observers.

Although the digestive system is very commonly deranged, the stomach and the bowels are not liable to specific gouty changes; fatty liver and a tendency to cholelithiasis is frequently observed; severe pain in the stomach or in the bowels may occur, but these seem to be of neuritic origin.

The skin is frequently affected.

Among the diseases of the skin allied to gout may be named erythema, eczema, urticaria, psoriasis, prurigo, and acne.

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A patch of eczema, of spontaneous development, signifies the existence, in the person possessing it, of a gouty diathesis. As it happens, the floor of the external auditory canal is apt to be the first spot on the surface of the body where an eczematous inflammation develops. This condition constitutes a valuable guide-post, pointing, as it does, at a very early stage to the existence of a gouty diathesis. A. H. Buck (*Amer. Jour. Med. Sci., Mar., '98*).

Bronchitis and asthma are often met with in gouty patients; there seems to be a certain antagonism between gout and tuberculosis; at least, it has been asserted by many authors that tuberculous changes develop very slowly in gouty patients.

Persons affected with gout rarely become tuberculous, and some patients with tuberculosis have had that disease decidedly checked on the supervention of an attack of gout, because uric acid and urates are antagonistic, not only to the pyogenic micro-organisms, but to the bacillus tuberculosis. Mollière (*Le Bull. Méd., No. 18, '88*).

Obesity and diabetes mellitus are often associated with gout. Uratic deposits have been found in the cornea and conjunctiva; uratic keratitis and iritis and gouty inflammation of the vitreous body have been observed.

Case of a gouty patient, of 54 years, who presented, in the anterior elastic lamina and in the proper tissue of each cornea, several opaque foci, connected by anastomosing lines. These opacities were proved to be due to a deposit of urate of soda. Chevallereau (*Recueil d'Ophthal., Apr., '91*).

Following conclusions reached after careful study of five cases of gouty retinitis and neuroretinitis: 1. The changes

in the fundus are always bilateral, though rarely symmetrical in the two eyes. 2. The degeneration in the walls of the blood-vessels and in the retina cause marked impairment of central vision, little or no loss of peripheral vision, and never end in blindness. 3. The loss of central vision is always progressive up to a certain point, unless the cause of the lesion is recognized early in the onset and immediately and properly handled. Improvement in the vision after the disease is established cannot be expected. 4. Hæmorrhages into the retina are rare except in the early stage of the disease. 5. The most marked feature in the fundus is the development of arteriosclerosis and phlebosclerosis. 6. Another almost equally pathognomonic symptom is the peculiar, yellowish, granular exudation in the retina, located by the ophthalmoscope around the posterior pole of the eye and generally leaving the macula intact. 7. The changes in the optic-nerve fibres seem to be almost entirely intra-ocular, and cannot be traced for any great distance back of the eyeball. Bull (*N. Y. Med. Jour., Aug. 12, '93*).

Gouty eye diseases occur intermittently, often once a year,—are very painful, but subside completely after a time. The subjects are usually adult men, who, though not liable to gout, have suffered from sciatica and the like. A somewhat peculiar form of destructive iritis, usually symmetrical, is occasionally met with in women who inherit gouty tendencies and have arrived at the climacteric period. It is sometimes almost painless. In men, the subjects of acquired gout, we sometimes see acute and very painful ulceration of the margin of the cornea of a definitely gouty nature, and curable by treatment suited to that diagnosis. Jonathan Hutchinson (*Archives of Surg., July, '95*).

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The changes induced by the gouty diathesis may consist in seroplastic inflammations, with or without perceptible excretion of uric acid. As examples are reported cases of scleritis, iridocyclitis with deposits between the choroid and

retina, nodules within the sclera, and one typical instance of episcleritis periodica fugax. Moreover, gout may be the indirect cause of ocular affections, especially in consequence of certain vascular changes, particularly precocious atheroma. To this category belong cases of severe relapsing disease of the vitreous humor, which finally leads to cataract, detachment of the retina, and retinitis hæmorrhagica. Certain sclerotizing affections of the cornea come under the same head. Some cases of glaucoma exhibit a relationship to gout. Wagenmann (*Deutsche med. Woch.*, No. 36, '96).

A frequent lesion is an insidious variety of exudative choroiditis, which appears under the clinical picture of so-called serous iritis or iridochoroiditis, usually occurring during the intervals between acute attacks.

Of all the obscure ocular lesions caused by an outbreak of gout this is the most treacherous.

This lesion of the uveal tract is the most frequent expression of the gouty diathesis.

Another less frequent lesion is iritis, associated with zona ophthalmica, or herpes zoster of the eye.

Another rare expression of gouty diathesis appears under the guise of a low grade of iritis, or of the iridochoroiditis referred to, the process being secondary to degenerative changes which affect the retina, and finally resulting in glaucoma.

The gouty diathesis is also one of the causes of glaucoma. Robert Sattler (*Med. News*, Jan. 22, '98).

When uratic deposits occur in the mastoid cells or in the cæcum tympani they may cause deafness.

Literature of '96-'97-'98.

Gout is a cause of ear disease, especially producing earache at night and tinnitus aurium without deafness. A Baum (*Phila. Polyclinic*, July 24, '97).

Rhinitis and parotitis urica have been mentioned, and also xerostomia, *i.e.*, extreme dryness of tongue and mouth

lasting for months. Angina and œsophagismus have likewise been noted.

Attention directed to the frequent connection between gout and irritation of the mucous membrane, more especially as seen in hay fever and chronic nasal and pharyngeal inflammations. William Davis (*Omaha Clinic*, Apr., '92).

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The symptoms of gouty affections of the throat are very similar to rheumatic affections, though the pain may be more intense. Small tophi have been seen on the vocal cords and at the cricoarytenoid joint, though this condition is exceedingly rare. Gouty deposits in the laryngeal mucous membrane have been diagnosed as cancer. Watson Williams (*Laryngoscope*, Apr., '98).

The urine of gouty patients is of varying aspect and nature; in persons disposed to gout the urine is ordinarily concentrated, loaded with urates, and a sediment of urates and uric acid is deposited; during the gouty attack the urine presents commonly the same character. In other cases the urine is pale and watery; there is diminution of its principal components, and traces of albumin may be found. In "poor gout" and in chronic cases which have weakened the constitution of the patient the watery, pale urine is frequently observed.

From the investigations of Vogel, Schmoll, Laquer, and Magnus-Levy it appears that before the attack and in the free intervals between them nitrogen is constantly retained in the body, whereas during the attack this is reversed, urea and also uric acid (His, Pfeiffer) being excreted at this period in quantities even exceeding the normal.

It is only the great proneness of the urine of persons subject to gout to part with its uric acid which is characteristic of that disorder, and not the mere abstraction itself. While from 3¼ ounces of the urine of healthy persons 30 to 45

grains of uric acid are obtained, from the urine of gouty persons the same quantity of urine only produces 3 to 7½ grains. Emil Pfeiffer (*Lancet*, Jan. 3, '91).

Persons suffering with gout, acute or chronic, have almost an immediate precipitation in the urine after passing it. If this precipitate is examined chemically, it will be found to differ from uric acid in its ultimate composition. This acid is only found in the urine during an attack of gout, and always in a free or uncombined state, while the uric acid remains in the urine as a urate and in solution. To this acid, and not to uric acid, the attack of gout is due. C. J. Rademacher (*Amer. Pract. and News*, June 21, '90).

Excretion of the alloxuric bodies (uric acid and xanthin bases) in gouty patients does not exceed that for the normal person unless possibly at the onset of an acute attack. Rommel (*Zeitschrift f. klin. Med.*, B. 30, H. 1 and 2).

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Although there is some increase of the alloxuric substances in the urine during acute attacks of gout, this increase does not overstep the physiological limits. Malfatti (*Wiener klin. Woch.*, vol. ix, p. 723, '96).

In gout no increase of the alloxuric substances at all found, and the relation between the excretion of uric acid and xanthin bases was normal. E. Schmoll (*Zeits. f. klin. Med.*, xxix, p. 510, '96).

Inability to confirm the statement that in gout the amount of the xanthin bases and uric acid together is increased, or that there is any constant relative excess of the xanthin bases as compared to the uric acid. Laquer (*Verhandlungen des Cong. f. innere Med.*, vol. xiv, p. 333, '96).

As already mentioned, a slight albuminuria may be occasionally found; but, even if that be not the case, symptoms of a disease of the kidneys are never failing in gout. I have examined many samples of urine from gouty patients and found that by the use of a centrifugal appara-

tus and a microscope I was always able to detect hyaline and granular casts in it, and am of the opinion that this indication of a morbid state of the kidneys is a constant symptom of all stages of gout.

Diagnosis.—The diagnosis of a typical attack of gout is easy not only as regards the localization of the morbid process, but also as to the development of the affection. Chronic gout may be confounded with other chronic affections of the joints of gonorrhœal, tuberculous, or neuropathic origin. Generally the diagnosis is facilitated by the clinical history of the complaint and by the examination of the affected articulation.

RHEUMATOID ARTHRITIS.—It may in many cases be difficult to distinguish between the chronic gouty affection of a joint and the morbid change caused by rheumatoid arthritis,—or, as it is more properly called, the polyarthritis deformans,—which disease attacks the cartilages, as well as the bone, and leads to destruction of the cartilage, to proliferation and thickening of the ligaments, and frequently to growths of osseous protuberances. In this malady there is no trace of uratic deposits.

The chief points of difference between gout and polyarthritis deformans are the following: In gout hereditary predisposition is commonly observed; the disease occurs more frequently in the latter classes than among the poor; it is most prevalent among males; in the clinical history there is often a record of abuse of alcoholic stimulants, beer, or strong wines; the patient may suffer from lead poisoning.

Irregular or atypical gout may be known (1) by demonstration, if possible, of uricacidemia; (2) the supervention of an attack of regular gout; (3) history of former attacks of regular gout; (4) hereditary tendency to gout; (5) exposure to lead poisoning; (6)

habits of life; (7) presence of urine of high specific gravity with lateritious sediments; (8) presence of gouty glycosuria in the family; (9) chronic interstitial nephritis; (10) the result of therapeusis. James Tyson (*Jour. Amer. Med. Assoc.*, June 8, '95).

In many cases the appearance of gout has been preceded by repeated attacks of renal colic or by long-continued evacuations of uric-acid sand in the urine.

Renal gout is distinguished from renal calculi by the attacks commencing generally with a chill, the pains always bilateral, and the passage of bloody urine is not painful. Mabboux (*University Med. Mag.*, June, '95).

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Thirty-four cases of gout compared with 49 cases of rheumatism. In the former the attack is more apt to be monarticular, the pulse is almost invariably of high tension, tophi can be occasionally observed, and in all cases of inflammation of the joints the points of greatest tenderness to pressure were the condyles or malleoli. In the latter disease the pulse is most frequently of low tension; the heart is commonly affected; a number of cases exhibit tonsillitis or pleurisy, and the first attack is nearly always polyarticular. When the joint is acutely inflamed there is much more superficial tenderness, and at the same time there are points of special sensitiveness, usually situated over the tendons in most immediate relation to the joints. When the hips and shoulders are affected it is exceedingly difficult to make out special points of tenderness in either condition. W. H. Thomson (*Amer. Jour. Med. Sci.*, Aug., '96).

Frequently (but by no means always) gout begins with an acute attack; tophi may be found on the external ear or elsewhere. The urine is usually found deficient in urea and uric acid by treating it in the centrifugal apparatus, while by examination of the sediment with the microscope, casts of the tubuli, hyaline

or granular, will always be detected in quantities more or less great. After the discovery of Roentgen the X-rays have been used as a diagnostic means; various investigators, especially French, have demonstrated that the uric-acid compounds offer no resistance to the X-rays. In a Roentgen photogram of a hand or foot affected by gout the clear lines between the bones indicating the articulations appear quite unaltered, and the extremity resembles very much a healthy extremity and differs only from it by the enlarged outlines of the fingers and toes. Greater deposits, such as tophi, are quite invisible in Roentgen photograms. The reproduction of a hand or foot affected by polyarthritis deformans presents quite a different aspect; all the articulations affected by the disease, even if it be not developed far enough to cause stiffness or enlargement of the joint, have lost their clear, transparent appearance, and are of an obscure, almost black, color. When the joint has been affected for some time, it is absolutely impossible to discern the exact place of the articulation, the bones seem soldered together, and that even in cases where a rather good mobility of the articulation still exists.

When all these facts are united, the clinical story, the examination of the joint and of the urine, and the aspect of the Roentgen photogram of the affected parts, the diagnosis will in most cases offer no insuperable difficulty.

Etiology and Pathogeny.—Gout is a markedly-hereditary disease affecting men much more frequently than women. As it often occurs in subjects having presented indubitable signs of gravel or uric-acid calculi, it seems to be in some way related to that complaint; it has often been observed that, in a family disposed by inheritance to gout, cases of

this malady alternate with cases of uric-acid gravel or calculi; hence the conclusion was drawn that both diseases had a common origin: the uric-acid diathesis.

Developed gout is rarely met with before the thirtieth and fortieth years; it begins rarely after the forty-fifth year, but may in hereditary cases even affect children.

Typical case of articular gout in a girl of only 11 years of age. Mabboux (Lyon Méd., Oct. 23, '92).

Persons who live freely, eat much meat, indulge in alcoholic drinks, and take little or no exercise are most subject to the disease; but it may also be observed in nervous, lean, underfed subjects, especially when they take much ale or porter and by their employment are exposed to cold and dampness. All sorts of excesses and overwork, bodily or mental, seem to be apt to provoke the attack of gout. Sydenham states that he always had an attack of gout following prolonged mental labor.

Workmen employed in lead-mills, painters, plumbers, and all persons exposed to absorption of lead are extremely disposed to be attacked by gout. (Garrod, Lancereaux, and others.)

Diffusion of lead in the system interferes with disassimilation, or retrograde metabolism, and thereby favors the formation of the uric acid and urates of gout. Georges Lemoine and P. Joire (Gazz. Méd. de Paris, Jan., '92).

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The clinical course of lead-gout shows several peculiarities different from those of an ordinary gout: (a) The attack occurs, as a rule, in a person relatively young. (b) Lead-gout has a tendency to spread rapidly over many joints of the body. (c) The localization of the joint-affection has the peculiar characteristic that frequently joints are attacked which in the ordinary gout are never, or but rarely, affected. (d) The tendency to

tophi-formation and deformative changes is, in lead-gout, much more marked than in common gout. The prognosis of lead-gout is always unfavorable. Luethje (Zeits. f. klin. Med., B. 29, p. 266, '96).

The disease prevails chiefly in cold and temperate climates, especially when the latter is at the same time damp and changeable; gout may, however, be found also in countries where the climate is warm and equal. Cantani found it to be not uncommon in Naples, and it is frequently observed among the Arabs of Algiers.

Indulgence in alcoholic drinks and excessive consumption of animal food predisposes to gout; it has therefore been called a disease of the well-to-do classes. Of alcoholic drinks, wines containing a large percentage of alcohol—such as sherry, port, and champagne—have the worst effect; the lighter wines, as claret or Rhine wine—are not so hurtful. Among the malt-liquors ale and porter are reputed to be much more conducive to the development of gout than the lighter kinds of beer; distilled alcoholic beverages—such as gin, brandy, and whisky—are by many authors believed to be less liable to cause the development of gout than beer or strong wine.

Although gout is a malady which has been known to physicians for thousands of years, its pathogeny and real nature is still a subject of debate.

As already stated, the deposition of urates in different structures is the most characteristic feature of gout; the origin of these deposits has consequently been investigated by many observers.

Garrod, in his celebrated work on gout, demonstrated that the blood of gouty patients contains more uric acid than in the normal state.

[This was done by mixing a few cubic centimetres of blood-serum or fluid from a blister with 10 or 12 drops of acetic

acid. Threads of cotton were placed in this mixture; this was covered by a watch-glass and left alone for from twenty-four to forty-eight hours. After that space of time the thread was thickly covered with characteristic crystals of uric acid, when the blood was taken from a gouty patient, especially immediately before an attack. The blood of healthy persons or of patients suffering from diseases not accompanied by uricæmia does not give the same results. F. LEVISON.]

The experiments of Garrod have been repeated by other observers, and it is now generally accepted that in gout, uric acid, in the form of urate of soda, is found in the blood in excess. Different questions now arise: How and where in the body is the uric acid formed and what is its physiological significance? Which is the uric-acid compound circulating in the blood and excreted in the urine, and how are these deposited to form tophi, etc.? What is the origin of the uricæmia in gout, and, if uric acid may also be found in excess in the blood in other diseases, why are deposits of uric-acid compounds only formed in gout?

The first question was, until the last few years, generally answered by the statement that uric acid, as well as urea, were products of the metabolism of proteids; the normal result of the complete oxidation of these was urea, only a small amount of proteids being left in a state of lower oxidation and excreted as uric acid. In some persons suffering from a slow and incomplete metabolism—retardation of metabolism—the oxidation of proteids was less perfect, and a larger quantity of uric acid was formed than in health.

In gout the process of nutrition is primarily at fault, and conspicuously that part of it which consists in the retro-grade changes and elimination of tissue-products. Oxidation in its various stages and degrees is not thoroughly carried

out, and the products of the waste and decay of the tissues, not being sufficiently transformed, linger in the blood and system, and appear to take an active part in the disturbances which arise. William Savory (*Lancet*, Jan. 13, '94).

Much labor has been spent in calculating the normal proportion of uric acid as to urea in the urine; this has been established by Haig as 1 to 33. According to this author, every departure from this proportion is pathological.

The old theory of the pathogenesis of gout contended that, when retardation of metabolism took place, much more uric acid than normally was formed; the uric acid accumulated in the blood, and when the blood had thus been loaded with the compounds of uric acid, it deposited them in the articulations, etc.

This theory has been overthrown by recent investigations. Kossel, Horbaczewski, and many other investigators have shown that uric acid is not a product of the metabolism of the proteids, but that it is formed by the oxidation of nuclein—an albuminous compound which differs from the proteids in that it contains a greater proportion of phosphorus. The nuclein is contained in the nuclei of cells, and may be prepared from all cellular structures, such as the spleen, the thymus gland, etc.

It has further been demonstrated by many experiments that the excretion of uric acid in the urine is increased or diminished by all factors (diseases, medicines, poisons, etc.) which give rise to a more rapid or slower disintegration of the cellular elements of the body and especially of the leucocytes. The ingestion of food causes a temporary leucocytosis (digestive) followed by an increase of the formation and excretion of uric acid. The amount of uric acid excreted in twenty-four hours is not much influenced by the nature of the food (animal

or vegetable); there is, however, this distinction noticeable: that the more easily digestible animal proteids set up digestive leucocytosis and formation of uric acid much quicker than the vegetable albumins, which are difficult to digest.

Uric acid and urate of sodium are the direct exciting causes of gout. By repeated experiments it is demonstrated that the production and elimination of urate of sodium is influenced both by food and certain drugs. When the diet was chiefly of meat or animal food the elimination was diminished, causing the urates to accumulate in the system, while the reverse occurred under a vegetable diet. A. Haig (Brit. Med. Jour., July 7, '88).

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The theory must be considered as proved which attributes the formation of uric acid in the body to a process of *leucolysis*, following on a leucocytosis. A review of the literature upon tissue-necrosis in gout leads the writer to state definitely that the process is caused by a poison, probably a nucleic acid, acting in a similar way to that in which tissue-necrosis is caused by lead in plumbism. Froelich (Jour. Amer. Med. Assoc., Jan. 3, '97).

While it is easy to increase the quantity of urea excreted in twenty-four hours by the ingestion of large quantities of proteids, the excretion of uric acid is not much influenced in that way. Weintraub, Umber, and Kühne have demonstrated that the excretion of uric acid may be increased to 2 or 2.5 grammes in twenty-four hours by giving large quantities of nuclein,—for instance, 500 grammes of the thymus gland,—whereas the normal excretion of uric acid varies from 0.4 to 1 gramme per day.

The augmented formation of uric acid will, of course, lead to a temporary uricæmia, which usually does not cause any morbid symptoms, but is only character-

ized by an extraordinary increase of the excretion of uric-acid compounds in the urine.

By chemical investigation of the gouty deposits, these have been found to consist of an acid compound of uric acid with soda, the so-called biurate, and it has commonly been stated that this was also the composition of uric acid circulating with the blood. Roberts has recently thoroughly investigated this question.

[Roberts's results have quite overthrown this theory. In text-books on chemistry, uric acid $U = (C_5H_2N_4O_3)$ is described as a dibasic acid, which can form a neutral (M_2U) salt and an acid salt biurate (MHU). The neutral salt can only be prepared by dissolving pure uric acid in a solution of caustic soda and evaporating to dryness, without the entrance of air. It can never exist in the body and we need not refer to it again. The biurate is the chief component of the tophi and was supposed also to be contained in the blood and the urine, and under circumstances to be precipitated as a brick-dust deposit. By examining this sediment Roberts found it to be an unstable compound which easily decomposes into uric acid and a soluble compound; by chemical investigations of different order it was demonstrated that the deposit formed by the urine cannot be regarded as a biurate, but is a quadriurate; *i.e.*, a compound of four equivalents of uric acid with one equivalent of soda or potash; its chemical formula is consequently H_2u , MHu . This quadriurate is a very unstable compound, liable to be decomposed into biurate and uric acid; this decomposition is effected by adding distilled water to the sediment and by many other fluids. The gouty tophi consist of biurate, but this salt is almost insoluble in serum,—even, at the body temperature, only in the proportion of 1 in 10,000. F. LEVISON.]

The researches of Roberts establish that, normally, uric acid exists in the blood as a quadriurate; under special circumstances the quadriurate may be trans-

formed in the blood to a biurate, which gives rise to the deposition of this compound in different parts of the body; the more uric acid is dissolved, the more quickly occurs the formation and deposit of biurate, but in all cases the uric acid cannot remain long in solution; if it is not quickly eliminated by the kidneys, transformation of the quadriurate and deposition of biurate is the consequence.

In serum rich in soda salts the biurate crystals are more easily separated than usual; irrespective of the acid with which they are combined, the salts of lime and magnesia, of lithia and piperazin do not affect the rapidity and the degree of deposition, whereas all salts of potash delay the deposition of crystals of biurate from blood-serum.

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The granular urate is always the precursor of the crystalline form, and in the body-fluids the uric acid circulates in the form of invisible granules of sodium urate.

Gouty deposits are only met with in non-vascular tissues, and, as acids and acid salts diffuse more rapidly and readily than alkalies and alkaline salts, we must suppose that the alkalinity of the non-vascular tissues is less than that of the blood. Hence if a transudate almost saturated with urate enters such a less alkaline tissue, the solution becomes supersaturated and granular urate is precipitated in the tissue, the precipitation being favored by such additional factors as lowered temperature or increased concentration of the fluids of the tissue. The precipitation of the granular urate in the spaces of the interstitial tissue and in the lymph-channels is the cause of the various phenomena of gout. In the course of time the urate deposited becomes converted into acicular crystals of sodium biurate, or, under favorable conditions, may be redissolved and disappear, and with them disappear the lesions to which they gave rise. C. Mordhorst (*Zeits. f. klin. Med.*, p. 65, '97).

The researches of von Jaksch have shown that in various diseases the blood contains an abnormal quantity of uric acid, and different authors have proved this to be the constant result of an increased disintegration of leucocytes. A physiological leucocytosis has been observed in the first days of life, amounting to the double or triple, followed in the fifth day by a sudden fall of the number of leucocytes almost to the normal; this is accompanied by an excessive formation and excretion of uric acid, giving rise almost constantly to the excretion of uric-acid sand and frequently to the formation of uric-acid infarctus in the kidneys (Gundobin, Fleusburg). Bartels, Laache, Ebstein, and various other investigators found an extraordinary increase of the daily excretion of uric acid in leukaemia; von Jaksch, Læhr, and Ewing observed a hyperproduction of uric acid and leucocytosis in pneumonia, and similar results have been found in the first stage of carcinomatous and all other diseases accompanied by leucocytosis. In all these maladies the hyperproduction of uric acid is distinguished only by the increase of the excretion of this compound, but the existing uricaemia is not conducive to gout or any of the symptoms of this complaint. The pathogenesis of gout is consequently not depending on uricaemia alone, and it is necessary to examine the special conditions under which uricaemia may produce gout.

Various theories have been proposed to explain this. The best supported of them shall now be shortly discussed.

According to Garrod, gout depends on a temporary or continuous decrease in the ability of the kidneys to excrete uric acid, by which an overcharging of the blood with uric acid is caused. Gout, in his opinion, is never caused by hyper-

production of uric acid, but by retention of it, although the progress of the disease is accelerated by temporary hyper-productions.

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Uric acid is not present under normal conditions in the blood of man or other mammalian animals, or in the blood of birds, but is normally formed in the kidneys alone probably by conjugation of urea with glyecocin. In gout uric acid is present in the blood as the soluble sodium quadriurate, and in this form has no toxic action. It is deposited from the blood as sodium biurate, and this crystalline deposit acts passively and physically as a foreign body in the affected tissue or organ. The presence of uric acid in the blood in gout is due to deficient excretion by the kidneys and its subsequent absorption into the blood from those organs; and in all probability such accumulation is always preceded by an affection of the kidneys either functional or organic, the most likely seat of which is the epithelium of the convoluted tubules. There is a second source of uric acid in the system, and that in such disorders as leucocythæmia it is formed from nuclein also, and passing into the blood is rapidly eliminated by the kidneys. A. P. Luff (*Lancet*, vol. i, pp. 857, 933, 1069, '97).

Garrod found a distinct diminution of the percentage of uric acid in the urine as well in chronic gout as in the acute cases, except during the attacks, when more uric acid than commonly was excreted; he, therefore, regarded the gouty attack as a salutary process which tends to deliver the system of its surplus of uric acid. It is to be regretted that the analytical methods used by Garrod (Heintze's method and the thread method) are not reliable enough to give full evidence to the correctness of his statements.

[Dyce Buckworth ("A Treatise of Gout," London, '90) and various other authors believe the cause of gout to be a

functional disorder of a definite tract of the nervous system; this is, however, only a supposition, and, even if his statement be accepted, it only removes the question to another field as long as the origin of the nervous derangement is not elucidated.

Ebstein ("Natur u. Behandlung d. Greh't") agrees with Garrod in the belief that in gout the blood is overcharged with uric acid, but he does not think that this arises from an affection of the kidneys. According to Ebstein, a primary gouty affection of the kidneys is a very rare occurrence; most frequently the kidneys remain for a long time healthy, and are only affected in the course of the disease in the same way as the articulations, etc. Ebstein's theory is that in gout uric acid is formed in excess in the body and that the hyper-production also takes place in regions which ordinarily do not produce uric acid—as for example, the bone-marrow, the cartilages, etc. When the blood and the lymph are overcharged with uric acid, it may act as a chemical poison, causing morbid processes in the tissues and giving rise even to necrobiotic changes; when these have reached a certain degree the biurate is deposited in the necrotic parts of the structures, whereas such deposition is never found elsewhere.

The theory of Ebstein must now be abandoned, as various authors,—such as Roberts, Cornil, and Riehl,—have found the crystals of biurate in comparatively healthy tissue, and have demonstrated that, after redissolution of the crystal needles, it was in many cases impossible to discover traces of necrobiosis in the structures in which the crystals had been imbedded. Moreover, experiments conducted by Ebstein and Nicolaïer have demonstrated that it is impossible to inject large quantities of dissolved uric acid in the veins of animals or in their peritoneal cavity without causing serious damage; the kidneys, which are obliged to excrete such excessive quantities of uric acid, are alone irritated mechanically by the crystalline uric acid precipitated in them.

Pfeiffer (*Berliner klin. Woch.*, '92;

"Handbuch der specieller Therapie," B. 1) believes that the precipitation of urates in gout and of uric acid in the kidneys in gravel are caused by a common uric-acid diathesis in which uric acid is produced in the body in a modified, almost insoluble form. In gout the uric acid is deposited as biurate without causing any morbid symptom, but when from any cause—as, for example, by the ingestion of alkaline drugs—the alkalinity of the blood becomes so great that the blood redissolves the urates, they give rise to irritation and inflammation. The experiments of Pfeiffer, as well as his conclusions, have been contradicted by Roberts and many other observers. The urine of gouty patients is not always more liable to precipitation of uric acid than normal urine, and, as Freudberg states, the alkalinity of the blood varies but little and cannot be modified by the commonly used doses of alkalies or acids.

Van Noorden ("Pathologie des Stoffwechsels," Berlin, '93) has proposed a new theory without trying to prove it. In his opinion gout is an inflammation of nervous structures caused by an unknown irritant; by this inflammation a fermentation is set up, giving rise to a local formation of uric acid in the diseased tissues.

Another theory is proposed by Kolisch (Wien. med. Woch., '95). This author admits that the uric acid cannot be regarded as an irritating poison causing inflammation and necrobiosis, but he points to the fact that, when uric acid is formed by the disintegration of nuclein, it is always combined with a series of basic products,—the alloxur bases (xanthin, hypoxanthin, adenin, guanin),—which, by injection in the veins of animals, manifest violent toxic effects. In Kolisch's opinion, the alloxur bases are changed into uric acid by the healthy kidney and excreted as such; in the uric-acid diathesis the alloxur bases are formed in excess in the body, the kidney is overcharged and cannot convert them into uric acid; the alloxur bases are excreted in abnormal quantity and set up irritation of the kidneys as well as of the various structures of the body, and

only when this inflammation has taken place the deposit of biurate occurs as a secondary symptom. This ingenious theory has already been abandoned, many observers having found that the chemical method (Krüger-Wulff) by which Kolisch demonstrated the excessive excretion of alloxur bases in gout, was not reliable, and that, moreover, the excreted quantity of alloxur bases varies so much as well in health as in disease that no conclusion can be drawn from their quantitative estimation. F. LEVISON.]

The phenomena of gout cannot be explained by a mere crystallization of urate from the blood or by the production of necrotic changes due to its presence in the circulation, seeing that in other conditions in which uric acid is present in excess in the blood—such as leucocythæmia and chronic nephritis—neither uratic deposits nor necrosis of cartilage are met with. Some unknown substances produce in gouty persons inflammation and necrotic changes in various tissues, and the necrosed tissues possess the power of attracting to themselves the excess of uric acid in the blood, while the chemical affinity of the necrosed parts for uric acid prevents the deposits from being redissolved by the blood. G. Klemperer (Deutsche med. Woch., xxi, p. 655, '95).

Although in the light of all the theories on the pathogenesis of gout discussed above and of the observations of innumerable investigators, many questions regarding the real nature of this complaint are still left unanswered, some facts are nevertheless settled beyond all doubt.

It is proved that in various diseases the blood contains an excess of uric acid and that gout is one of these diseases; secondly, it is certain that an excess of uric acid does not cause the deposit of biurate as long as the kidneys are healthy and their action normal.

In all described cases of gout, in which the post-mortem examination is men-

tioned, the kidneys have been found diseased, and in almost all cases they were suffering from granular atrophy. Ebstein reported two clinical cases of gout in which the kidneys had been found healthy, but close investigation revealed the fact that the cases were so incompletely described as to be utterly valueless in that respect.

In all cases of granular atrophy of the kidneys, the power of elimination of the kidneys as regards uric acid, as well as various other substances, is diminished. Charcot found it defective under the administration of turpentine, which does not give the urine the characteristic odor of violets when the kidneys are granular atrophic. The consequence of this defective elimination of uric acid is its retention in the blood (von Jaksch), and various observers (Ord and Greenfield, Norman-Moore, Levison, Luff) have demonstrated that in granular atrophy of the kidneys deposits of biurate in the joints are very frequently found, even when no symptom of gout has been manifested during life.

Lead poisoning resembles gout in giving rise to an excess of uric acid in the blood, although it is not accompanied by leucocytes or increased disintegration of whole blood-corpuscles. Now it appears from experiments on animals (Charcot, Binet, Coen, and d'Ajutolo), as well as from observations of persons exposed to lead poisoning, that one of the earliest and most constant symptoms of this disease is a pathological change of the renal tubuli conducive in rather short time to granular atrophy of the kidneys. This accords very well with the fact that lead poisoning is very liable to give rise to gout, and that Garrod, Lancereaux, and various other observers have found that a large percentage of their gouty patients suffered also

from the consequences of lead poisoning.

It has been proved by many experiments that continued irritation of the kidneys by chemical or mechanical irritants leads to inflammatory processes and formation of new connective tissue, resulting in granular atrophy. When the kidneys of patients suffering from gravel and calculi for some time are examined granular atrophy is always found.

When gouty persons are attacked by an intercurrent disease causing a temporary hyperproduction of uric acid,—as, for instance, pneumonia,—they are sure to get an attack of acute gout in connection with it.

When all these facts are combined and confronted they seem without exception to point to a theory of gout closely allied to the views proposed by Garrod.

Gout and its principal symptom—the deposition of biurates—occurs when the blood remains for some time overcharged with uric acid which cannot be eliminated by the kidneys on account of a decrease of their secretory power, which, in turn, is caused (with very few exceptions) by granular atrophy more or less distinctly developed. In all cases of gout the kidneys are diseased, and the gout can never develop as long as the kidneys remain healthy. The morbid state of the kidneys may either be due to inherited predisposition (gout in children, early gout hereditary in families) or be acquired by chronic irritation (lead poisoning, abuse of alcoholic stimulants, uric-acid gravel and calculi). As long as the deposition of biurates progresses very slowly no symptom whatever is caused by it, and it is even possible that the deposits may be redissolved without having caused pain or injury at all; but when the deposits grow too large or when from any cause (excesses of every kind,

intercurrent diseases, etc.) the production of uric acid gets very large, the deposits increase quickly, the lymphatics are obstructed, and a genuine attack of acute gout is produced. Injudicious therapeutics, such as the abuse of alkaline remedies or springs, are liable to produce attacks of gout by the ingestion of large quantities of sodium salts, which have a distinct deterrent influence on the solution of the quadriurates in the blood.

This theory does not explain all the various and anomalous symptoms of gout, and the question is left unanswered as to why all patients suffering from granular atrophy of the kidneys are not attacked by gout; but it has the advantage that it brings into one category all the etiological and pathogenic factors with which we are acquainted, and gives a plausible explanation of the origin of gout as well of the rich and overfed classes as of the poor and badly nourished. By this theory the close alliance of uric-acid gravel with gout becomes intelligible, and the enigmatic gout caused by lead impregnation has a rational explanation.

Pathology. — The most characteristic pathological change found in gout is the presence of deposits of biurate in various tissues. The order of invasion is fairly constant: the diarthrosial cartilages are the first to be affected; then the ligaments, tendons, and bursæ; next the connective tissue and the skin become impregnated. Of the articulations the metatarso-phalangeal joint of the great toe is generally first affected, then the different metatarso- and metacarpo-phalangeal articulations, the tarsus and carpus, and next the larger joints; but their order is not constant. Almost all joints are attacked by gout,—perhaps with the exception of the hip-joint. The deposit first occurs in the superficial part

of the cartilage close under its surface, in the form of fine, crystalline needles forming a more or less close net-work and presenting different degrees of opacity; sometimes it may be so small as to require the aid of a microscope for its detection. At first the central parts of the cartilages only are impregnated, whereas the peripheral tissues are free from deposits, but present some vascularization. Subsequently the fibrocartilages, ligaments, and synovial membranes become involved with white chalk-line deposits consisting of biurate; the synovial fluid may also contain crystal needles. The articulations become stiffened or fixed and ultimately they are greatly distorted and nodulated. The skin covering the affected joint becomes distended, and it may even be destroyed, exposing chalky masses, which break down and are successively evacuated, frequently giving rise to suppurative and ulcerative processes of the skin. It does not mean that the deposit is specially infiltrated in the cells, but rather that it pushes its way without special regard as to the component elements of the cartilage.

The periosteum and bursæ may also be implicated, and some authors have even believed that the bone itself may become affected. Virchow has described isolated infiltrations of biurates in the spongy tissue of the phalanges, and in the marrow of the bones deposits may occur, mostly, but not always, in the neighborhood of incrustated cartilages.

Marchand and Lehmann have made chemical analysis of bone-tissue of gouty patients, and found that when the cartilages and the periosteum were removed the osseous tissue itself did not contain uric acid. Garrod observed that in gout of long standing the osseous tissue of the phalanges may become rarefied and the

vacuoles filled with fat; by this process the bones are rendered more fragile than in the normal state.

Heberden observed a knotty or bosselated condition of the terminal phalangeal joints; this pathological state of the fingers has been known as Heberden's finger. In Heberden's opinion, the knots are not of gouty origin, but caused by arthritis deformans; a similar formation of the phalanges may, however, also be observed in gouty patients in very advanced life.

Deposits may be found in various other parts of the body, such as the external ear, eyelid, nose, and larynx; they form there nodules—tophi—which at first contain a liquid, but after some time get hard. Garrod evacuated from a single tophus of the hand 60 grammes (2 ounces) of biurate.

The muscles of gouty patients are ordinarily atrophic, especially when the extremities get stiffened and immovable.

The heart is frequently hypertrophic; myocarditis may occur, leading to the formation of fibroid or fatty degeneration of the muscles. The endocardium is sometimes in a state of chronic inflammation, and uratic deposits have been observed in it. In the aorta arteriosclerotic changes and uratic deposits have been noticed.

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In the concretions in sclerosed aortic valves urates can sometimes be demonstrated by the murexide reaction, along with calcium phosphate and carbonate. More frequently gout causes valvular lesions indirectly as the result of sclerotic changes, but in this process other factors, such as abuse of alcohol or tobacco, lues, or overeating, assist. Gout is more prone to cause motor and sensory cardiac neuroses. Beginning with palpitation, soon followed by tachycardia, dilatation of the ventricles develops, with all its con-

sequences. The sensory disturbances vary from mild, pricking pain in the region of the apex or more severe radiating pains to paroxysmal pain, with tenderness on pressure over the sternum or the base of the heart. The latter condition is often associated with symptoms of heart-weakness and can lead to angina pectoris. The prognosis in pure cases, not too far advanced, is good under proper treatment. Th. Schott (Berliner klin. Woch., Nos. 21 and 23, '96).

In the digestive tract congestion and a catarrhal state are found, as well as ulceration of the mucous membrane; but, as the ulcerations are observed only when the granular atrophy of the kidneys is fairly developed, they are probably caused by the renal disease and cannot be regarded as directly gouty.

The liver is commonly enlarged and in a state of fatty infiltration or of interstitial hepatitis; when this is the case, the spleen may also be enlarged.

The kidneys are always more or less pathological. In the large majority of cases they are granular,—atrophic: the kidney is contracted with a rough and granulated surface, small cysts are commonly seen on it, the capsule is adherent in different places, the color of the organ is red, the cortical substance warty and granular, and the walls of the arteries generally thickened; in short, the gouty kidney is identical with the small, granular kidney. In some cases deposits of biurate are found in the tubuli or between them, appearing as whitish points or lines in the red structure of the organ. Uratic deposits may also be found in the pelvis and in the bladder.

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In connection with the atheromatous changes which take place in the arterioles in gout is the gradual progress of the renal disease, the organ being affected in spots, with intermissions in the degenerative changes which are micro-

scopical in size, until finally large areas are involved. In those cases the glomeruli and tubules are attacked in a way at times to cause scarcely an appreciable symptomatology, whereas the same change coming on suddenly, as in cases of a different etiology, cause striking clinical and urinary manifestations. The arterial changes in the nervous system lead to various nervous disturbances by interference with the nutrition of nerve-centres. Cerebral manifestation may arise from uræmia or from thrombosis of the cerebral arteries. N. S. Davis, Jr. (N. Y. Med. Rec., July 10, '97).

A few observers have noticed the presence of urate deposits in the meninges of the brain and in the neurilemma of peripheral nerves.

Prognosis.—Acute gout is rarely immediately fatal; the attacks are very liable to return, but much depends on the mode of living adopted by the patients. Chronic gout decidedly shortens the life of the patients and often results in crippling them completely. The kidneys are always diseased in gout, and, when the granular atrophy of the kidneys develops to its utmost, there may be serious danger from the retention of the constituents of the urine, and gouty patients may die from uræmia.

Gout diminishes the power of resistance against acute disease and injuries; many gouty patients, nevertheless, reach an advanced age.

The prognosis of gouty heart is decidedly good. T. Mitchell Bruce (Practitioner, Jan., '95).

Treatment.—Prophylactic treatment of gout is of the greatest importance, not only to prevent the first attack in the case of hereditary disposition, but also after the first attack to prevent or at least delay recurrences. Gouty patients should avoid all aliments containing much nuclein, which, necessarily, tends

to increase the percentage of uric acid in the blood; hence are contra-indicated all glands and internal organs composed chiefly of cells, such as brain, kidney, liver, and especially thymus gland; also meat-extracts contain much nuclein and are not to be allowed. Eggs do not contain nuclein, but paranuclein, which in the body is not decomposed into uric acid, and moderate quantities of eggs, therefore, can be eaten by the patients.

As the proteids do not change into uric acid, there is no reason to prohibit meat or fish in moderate quantity; about 200 grammes daily is quite sufficient, and a larger quantity will only tax the digestion and the secretory power of the kidneys.

Every influence which may lead to irritation or injury of the kidneys must be eliminated, and in particular alcohol and diet that might increase the amount of irritating alloxins must be interdicted. Among the latter are flesh rich in cellular constituents, while muscle, particularly such as has been boiled, is permissible. The carbohydrates and fats may be allowed. Milk and eggs are entirely unobjectionable, as the nucleins contained do not form alloxins. Of the vegetables, salads and greens, excepting such as asparagus, are useful. Overexercise should be avoided on account of the tendency to increase the alloxin productions. Kolisch (Wiener klin. Woch., No. 45, '95).

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In various cases of gout the prolonged administration of only red meat and hot water has resulted in marked improvement, which persists in spite of gradual return to an ordinary dietary. It is the complex chemical changes brought about by the admixture of red meats with carbohydrates and sugar that causes the excessive formation of uric acid. The patient is given daily allowance of from 1 to 4 pounds of lean beef-steak, minced and cooked in various ways, the patient drinking from 1 to 5 pints of hot water,

and avoiding all starchy, saccharin, and fermentative articles of food. This treatment is indicated in obstinate chronic gouty arthritis, in recurrent uric-acid calculi, in frequent and intractable migraine, and in cases of persistent gouty dyspepsia.

This treatment should be prescribed but rarely, and then only under the most careful supervision in cases in which the heart or kidneys are discussed. Used with due care, it is a most efficient and brilliant addition to the therapeutic measures. Armstrong (*Brit. Med. Jour.*, May 1, '97).

The uric acid taken in the food constitutes the bulk of the uric acid eliminated. The avoidance of animal food containing xanthin compounds or uric acid, and also tea, coffee, and cocoa, whose alkaloids are similar xanthin compounds, will gradually eliminate excess of uric acid in the system. The time when this may be accomplished may be determined by administering a dose of salicylate of sodium. If any of the excess of uric acid still remain in the system, this drug will cause an immediate great increase of the uric acid as compared with the urea. If anyone taking a dose of salicylate of sodium gets as a result an excretion of uric acid greatly above the relation to urea of 1 to 30, such person is not free from uric acid. A. Haig (*Brit. Med. Jour.*, Mar. 27, '97).

All sorts of farinaceous aliments, bread, milk, and vegetables of every kind are to be allowed.

For gouty patients a diet of fresh vegetables and fruits, with meat sparingly, and the exclusion of sugars and starches recommended. To remove the diathesis active physical exercise, alkaline baths followed by friction, and the use of lithium salts well diluted. Nothnagel (*Internat. Klin. Rundschau*, Feb. 14, '92).

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Administration of milk increases the excretion of xanthin bases and reduces that of uric acid. Increased quantity of liquid (water) in the diet increases the alloxin bodies (uric acid and xanthin

bases) 'in healthy persons. Fatty milk, according to Gärtner's formula, is recommended as a suitable diet for all cases of gout. Laquer (*Berliner klin. Woch.*, Sept. 7, '96).

There are three great manifestations of the same condition. These are rheumatoid arthritis; podagra, or true gout; and articular rheumatism. One must not attempt to treat gout, but treat the subject who comes before him. There is no diet for the gout, but there is a diet for the patient. Nevertheless, in the large majority of cases sugars and starches must be cut off. But in spare gouty subjects farinaceous diet may be essential. Milk probably suits the largest number of gouty patients. Patients who can take but little exercise at first can gradually be led up to the point of taking a great deal of exercise, and this is essential for prevention of further attacks. Strontium salicylate is less disturbing than salicylate of soda. In some instances it agrees better with the patient when combined with digitalis and strychnine. Medicines, however, will not eradicate the diathesis. H. C. Wood (*N. Y. Med. Rec.*, July 10, '97).

It is useful to prescribe rather large quantities of inoffensive beverages, such as pure water and milk, especially skim-milk or butter-milk, to favor the free action of the kidneys. The quantity of urine per twenty-four hours ought to be about 1500 to 2000 grammes (3 to 4 pints). Alkaline springs have been much recommended, and when they do not contain too large quantities of soda they may be taken in moderate doses. Their use, however, should not be exaggerated, as the ingestion of much soda in the blood is liable to accelerate the deposition of biurate, and thus provoke an attack of gout.

The light wines—such as Bordeaux, Mosel, and Rhine wine—may be allowed in small quantity; the stronger wines—such as sherry, port, champagne, etc., as well as ale and porter—are to be

strictly prohibited. The pernicious effects of the stronger alcoholic drinks are proved by numerous observations, and are probably due to the power of alcohol to increase the formation of uric acid and to facilitate the deposition of urates.

The deleterious effects of alcoholic liquors in producing gout depends very much upon the incompleteness of the process of fermentation by which they are produced. The sugar alone is not claimed to be injurious, but only when taken with the alcohol or some other article of diet that induces it to foment in the digestive organs. Editorial (*Nice-méd.*, July, '92).

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Attention called to the fact that those accustomed to a saccharin diet have no special tendency to gouty arthritis, and that the urine of herbivorous animals, in whose diet sugar plays an important part, is alkaline in reaction. The relation of champagne to gout is difficult to determine, as the constituents of various preparations vary greatly. Of its constituents, sugar is, according to the author's view, the least and acetic acid the most harmful. G. Harley (*Lancet*, Aug. 1, '96).

Open-air exercise is very useful in the treatment of gout, and, when possible, gouty patients ought to spend their holidays in regular active exercise, such as walking, cycling, riding, etc.

TREATMENT OF THE ACUTE ATTACK.

—Abortive treatment of an acute attack of gout has repeatedly been tried, but it is not to be recommended, being attended with great risk. The method proposed has been strapping the affected joint with adhesive plaster; the application of snow or ice; the hypodermic injection of morphine; large doses of colchicum, etc. Undoubtedly the attack may be stopped short by these methods, but very dangerous symptoms, such as fainting, disorder

of the action of the heart, etc., have been observed as the immediate result of these procedures.

Although medicine has now abandoned the old maxim that during the attack the affected joint was only to be treated "with flannel and patience," the treatment of the attack ought not to be too active. The patient should remain in a recumbent position, though not necessarily in bed, for some days; the affected limb should be raised and supported, kept warm, and protected from pressure. The pain is relieved by warm alcoholic lotions, application of opium ointments or liniments; menthol in an alcoholic solution. Ointments of ichthyol are also to be recommended.

In mild attacks of acute gout, absolute rest, diluent drinks, and the application to the affected joints of an ointment composed of sodium salicylate, 1 1/4 drachms, and lanolin, 1 1/2 ounces, recommended. W. Morain (*Bull. Général de Thérap.*, July 30, '95).

Most of the remedies are useful, mainly through the suggestion of relief they afford to sufferers. Blood-letting and blisters were formerly in use, but are now generally abandoned.

English practitioners often begin the treatment of an attack of gout by the administration of a free purgative: calomel and jalap or *mistura sennæ composita*.

Best results obtained from giving fractional doses of calomel at the beginning of an attack of gout until it freely moves the bowels. F. Grimm (*Le Praticien*, May, '93).

Of remedies directed toward the gouty process itself colchicum is the most effective; its mode of action is obscure, but it seems to relieve the pain better than any drug; colchicum is ordinarily prescribed as wine of colchicum and may well be combined with tincture of aconite; 25

minims of wine of colchicum with 3 to 5 minims of tincture of aconite may be given three or four times daily. The use of colchicum ought only to be continued from four to six days, as it is liable to produce nausea and diarrhoea, and even paralysis of the nervous centres when taken too long a time. A very active principle of colchicum—the colchicine—has also been employed. As soon as the anodyne effect of colchicum has been reached the use of the drug is to be discontinued. Under any circumstances, however, it should no longer be given when nausea or diarrhoea sets in.

Colchicum is *par excellence* the specific for gout. Lecorché (La Méd. Mod., July 14, '94).

Literature of '96-'97-'98.

To check the excessive formation of uric acid, liver-metabolism should be promoted, and congestion of the portal system relieved by regulating the diet and regimen. Colchicum and guaiacum, as stimulants of hepatic metabolism, are very useful in many forms of gout. Constipation and the congestion of the portal system may be relieved by occasional doses of blue pill followed by an Epsom-salt purge.

To promote the elimination of the quadriurates formed in the kidneys and so prevent their absorption into the blood is to strike at the primary evil in the causation of gout. To promote this, diuresis should be increased and the acidity of the urine diminished. Citrate of potassium is a good diuretic which not only increases the solubility of the quadriurates, but also diminishes the acidity of the urine, and should be pushed until moderate alkalinity of the urine is produced.

The removal of uratic deposits and the elimination of quadriurates and biurates from the system may be attained by free diuresis, baths, and suitable exercise, and the careful selection of a mixed diet with a fair amount of vegetable food, since the mineral constituents of certain vegetables—such as Brussels sprouts,

cabbage, French beans, spinach, turnips, and turnip-tops—possess to a remarkable degree the double function of inhibiting the conversion of sodium quadriurate into the biurate and increasing the solubility of the latter; but the idiosyncrasy of each patient to various articles of diet must be made the subject of careful observation. Luff (Indian Med. Rec., July 1, '98).

Although the salicylates are certainly inferior to the colchicum, it is advisable to try them when colchicum is not well borne or when it fails to alleviate the pain. Generally the salicylate of sodium is used; the salicylate of lithium has also been recommended.

Literature of '96-'97-'98.

Sodium salicylate causes an increased excretion of uric acid, because it causes an increased formation. Bohland (Centralb. f. innere Med., vol. xvii, p. 70, '96).

The clearing of the system of uric acid by alkalies or salicylates leaves the principal part of the work undone, which is the use of suitable remedies to correct the faulty metabolism in whatever system the disease first arose. M. A. Boyd (Lancet, Aug. 8, '96).

When the pain has subsided and the swelling of the joint is somewhat diminished, gentle use of the joint and careful (but not energetic) massage are useful.

In the interval between the attacks the tendency to renewed attacks by the prolonged use of alkalines is of importance. Of these the carbonates and the phosphates of sodium and potassium and the carbonate of lithium have been most employed, but their use is now known to be based upon fallacious deductions.

[The administration of alkalines is based upon the theory that gout is caused by a lessened alkalinity of the blood. The alkaline remedies, by augmenting the alkalinity, would increase the power of the blood to dissolve uric acid and thus prevent the deposit of biurate.

The experiments of Roberts have quite destroyed this fundamental hypothesis by proving that in gout there exists no abnormal acidity of the blood and that addition of carbonates or phosphates of alkalines to blood-serum impregnated with uric acid does not retard the precipitation of biurate; the alkalines are consequently without power to prevent the formation of uratic deposits, and salts of soda may even prove directly pernicious when taken in large doses.

Carbonate of lithia was introduced in the therapeutics of gout by Garrod expressly on account of its chemical action. A solution of carbonate of lithia has great solvent power on uric acid, and from this fact it was inferred that lithia administered internally might communicate its power to the urine and the blood, and that in this way as well the formation of uric-acid gravel as the deposition of biurates in gout might be prevented.

Neither of these inferences are justified. Mendelsohn (Berl. klin. Woch., '93) has shown by numerous experiments that the urine of persons to whom carbonate of lithia had been freely administered did not dissolve more uric acid than normal urine, and he observed, moreover, that the addition of normal urine to a solution of uric acid, effected by the aid of carbonate of lithia, was sufficient to precipitate almost all the uric acid contained in it. When carbonate of lithia has some value in the treatment of gravel it is only on account of its action as a powerful diuretic. Roberts demonstrated that the addition of carbonate of lithia to blood-serum or to synovia has not the slightest effect to enhance the solvent power of these media on sodium biurate or in retarding its precipitation from serum or synovia impregnated with uric acid. F. LEVISON.]

Various basic organic products—piperazin, lycetol, lysidin—have recently been recommended as specifics for uric-acid gravel and gout on account of their power to dissolve uric acid. Mendelsohn has tried the effects of all these compounds, and found that urine saturated

with them does not dissolve uric acid any more than normal urine, and they are, of course, still more ineffective when circulating in feeble concentration with the blood.

In an old gouty case, by daily injection of 5 minims of hydrochlorate of piperazin, the uric-acid deposit in the urine was very materially lowered. Bardet (Münch. med. Woch., June 16, '91).

Piperazin highly recommended in the treatment of both acute and chronic gout. It may be given to the extent of 15 grains per day, largely diluted with water. Schweininger (Jour. of the Amer. Med. Assoc., Sept. 24, '92).

Lysidin has proved to be a powerful remedy for gout, the pain ceasing soon after its use is begun, the joints becoming supple and the tophi diminishing. E. Grawitz (Deutsche med. Woch., No. 41, '94).

Literature of '96-'97-'98.

In acute gout piperazin causes a rapid amelioration of the pain and a progressive diminution of the swelling and redness. In chronic gout it appears to have an elective action upon tophi and upon the articular stiffness. The author has seen voluminous tophi disappear and deformed limbs assume an almost normal aspect, due to the persistent usage of the remedy, which is possible by its harmless action upon the organism. Delmis (Gaz. des Hôp., Mar. 5, '96).

Uricedin, a new remedy proposed by Mendelsohn, is a combination of citrate of sodium, sulphate of sodium, and small quantities of common salt and citrate of lithium. It may be of use in the treatment of uric-acid gravel, but in gout it is about on a level with the other compounds of soda.

MINERAL SPRINGS.—A considerable number of springs to which gouty patients commonly resort are strongly impregnated with the salts of soda; it is not, therefore, surprising that not infrequently the first result of the cure is to

provoke an acute attack of gout or to aggravate the symptoms with which the patient was suffering. The physicians practicing at these resorts are accustomed to consider this aggravation as of good augury. Perhaps they are right, as it does happen that a patient, who for some time has been laboring under the preliminary symptoms of gout, feels better when the attack has passed over and a large quantity of uric acid has been removed from the blood; but it is a rough mode of cure, and many physicians, especially the English, now advise the patients to avoid strong alkaline springs or to take them very sparingly. Roberts resumes his opinion of the strong alkaline springs (Vichy, Carlsbad, etc.) in the treatment of gout in the following words: "It is difficult to believe that they can do any direct good, and easy to believe that they can do direct harm."

In cases of gout in which the urine constantly precipitates crystals of uric acid, it is advisable to prescribe some alkaline remedy or alkaline spring-water, to prevent the precipitation and the irritation of the kidneys caused by it; the doses should, however, be regulated by the degree of acidity of the urine, and not more of the alkaline drug is to be taken than necessary to reduce the acidity of the urine to the normal level and thus render it limpid and without deposit of crystals.

Some springs are devoid of the dangers dependent on the use of the strong alkaline waters, as they do not contain the salts of soda or only very small quantities of them; they are either aerated, contain but little besides the pure, warm water, or they contain some carbonate of lime or sulphate of lime; in many cases the free use of these springs, combined with douches, moor-baths, massage, and hydrotherapeutics in its different appli-

cations will be useful, especially against the stiffness of the joints remaining after acute attacks.

Hydrotherapy recommended in the treatment of gout, but not during the attack. Rubino (*Blatter f. klin. Hydrotherapie und verwandte Heilmethoden*, June, '93).

Among the most renowned springs of this kind may be mentioned Buxton and Bath, in England; Aix-les-bains and Contrexéville, in France; Wildbad, Gastein, and Pfeffers, in Germany and Switzerland; and Sandifjord, in Norway.

Of the drugs which have been recommended against gout, guaiac merits special mention. It was introduced by Garrod, and is administered in a dose of 7 to 10 grains of the resin daily, ordinarily combined with iodide of potassium or quinine. It seems to have a very good effect in many cases, as it is well supported by the patients, even under protracted use. It seems to retard the return of the gouty attacks.

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Guaiac does not effect the formation of uric acid, but acts directly upon the kidneys as a stimulant, enabling it to get rid of any accumulation in the tubules, thus preventing absorption from them into the blood. Garrod (*Med. Rec.*, July 4, '96).

Edison, and after him Labatut, Levison, Chauvet, and Gilles, have advocated the electric treatment against the stiffness of gouty joints; by this treatment remedies are introduced through the skin by the aid of a galvanic current. The experiments of Labatut and other scientists have demonstrated that the alkaline substances enter in the body with the positive current, whereas the acids are introduced with the negative. The remedy employed in this way against the gouty affections is lithia, which is

liberated by the decomposition of the salts of lithia by the electrolytic effect of the current and enters through the skin in the nascent state, and consequently in a very effective condition. Labatut conducts the dielectric treatment in the following way: A 2-per-cent. solution of chloride of lithia is rendered alkaline by addition of some caustic lithia or carbonate of lithia, and the hand or foot which is to be treated is placed in a saucer filled with the solution, into which also the positive conductor is plunged, taking care that the conductor does not touch the skin; the negative conductor (both conductors are made of charcoal) is placed in another saucer filled with a feeble solution of common salt, and some part of the body, hand or foot, is put in contact with this liquid. A current of 15, 20, or 25 milliamperes is used, according to circumstances, and each *séance* is of 30 minutes' duration. By the continued use of this method, I have in many instances succeeded in restoring to gouty joints the mobility which had been lost for several years. While it is also possible to dissolve tophi, some part of the swelling caused by the deposits will, however, always remain, as the tophi do not consist only of biurate of soda, but contain also new-formed connective tissue, which cannot be dissolved by the lithia.

Electricity recommended for promoting the removal of gouty concretions. Thomas A. Edison (Brit. Med. Jour., Aug. 16. '90).

Literature of '96-'97-'98.

Static electricity is the best treatment in hereditary gout, and will prevent attacks, if used judiciously at the right time. Static electricity and other electric currents will cure many of the other varieties of gout. Static electricity acts as a general tonic. It replaces exercise

and acts as passive motion. R. Newman (Med. Rec., Dec. 11, '97).

Another new and valuable addition to the therapeutics of gout is the hot-air bath. In all the different forms of baths, mineral bath, moor-baths, Turkish, and Russian baths, which have been employed for a long time with varying success against gout, the heat is the common active principle. It is difficult to bear more than 50 or at most 60 degrees of Celsius when the heat is applied as vapor-bath, moist air, or hot water; but when the heat is administered by means of dry air, a far higher temperature is borne without pain or damage.

Tallermann, of Sheffield, and Betz, of Chicago, have invented ingenious apparatuses, by which an arm or foot may be exposed for from 30 to 50 minutes to a current of dry air heated to 100-150° C. and even more, and many observers (Knowsley, Sargent, Mendelsohn, Levison) have noticed the good effects of this treatment against the stiffness of gouty articulations, especially when it is combined with the use of massage.

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Attention called to an apparatus which has been employed in a series of cases in the University Hospital, where some 300 baths were given to test its efficiency. It was found to be most satisfactory. The required temperature can be obtained quickly, in from 10 to 15 minutes, and the apparatus is substantially but simply constructed, and involves nothing that can get out of order or require repair. The cases that were treated included acute and chronic articular rheumatism, gonorrhœal rheumatism, gout, traumatic arthritis, synovitis, tenosynovitis, and fibrous ankylosis.

The method of administering the bath is as follows: The patient's pulse and temperature were first taken and recorded. The limb, first being completely enveloped with a piece of lint, which was

wrapped loosely about the part, was then placed in the cylinder. The time allowed for each bath was from three-fourths of an hour to an hour. At intervals of 20 minutes the door of the cylinder was thrown open momentarily to allow of the ingress of a fresh supply of air. If the patient perspired freely, this opportunity was taken advantage of to wipe the limb thoroughly dry. If this precaution is not taken and the limb is allowed to remain bathed with sweat, there is the possibility, if the temperature is exceedingly high, of a superficial burn resulting. This happened in several cases where the precaution was not taken. The degree of temperature employed varied, some patients bearing with perfect comfort a degree of heat which would be extremely painful to others. The average was about 300° F., although in one case the temperature reached 375°, to which the patient seemed quite indifferent. The frequency with which the baths were given varied with the severity of the case; usually, however, they were administered on every other day.

Certain physiological phenomena followed the application of heat, such as increased arterial tension, elevation of the blood-pressure, dilatation of the lumen of the blood-vessels, diminution of the erythrocytes, decrease of hæmoglobin, increase in the elimination of nitrogen, and increase in frequency of the heart's action. In cases in which there is a diathesis, either rheumatic or tuberculous, this treatment can have no beneficial constitutional effect.

Permanent cures of local lesions, symptomatic of diathetic diseases, are not to be looked for from the employment of hot-air baths, but for the relief of joint affections of traumatic origin this method of treatment is most useful and sometimes indispensable, and the results obtained can be called permanent. C. H. Frazier (*Annals of Surg.*, Oct., '97).

A year's experience with the Sprague hot-air therapeutic apparatus has demonstrated that it has not often been disappointing in its action in the usual types of gout or rheumatism. Even where tophi have formed, the solidifica-

tions are frequently softened and carried off through the excretory organs.

The skin and kidneys are stimulated by the hot blood, and circulation is restored to the affected part.

All cases, as far as heard from, have kept what they gained, excepting in so far as they have returned to errors of diet and lack of exercise. As a matter of course, the originating causes may induce a return of the trouble.

The failure of an apparatus to run to a very high temperature must certainly curtail its usefulness. This mode of treatment becomes a most useful adjunct to medical and surgical treatment. A. Graham Reed (*Phila. Polyclinic*, Aug. 6, '98).

To sum up, the principles of the treatment of gout are these: In all cases the diet is to be regulated with a view to sustain the forces of the patient without allowing any excess of food; the patient is to be advised to limit the use of alcoholic stimulants and to avoid equally excess of work and of enjoyments, whereas bodily exercise and open-air life are useful. The patient ought to drink pure water of some aerated spring in sufficient quantity to keep the daily excretion of urine from 3 to 4 pints; if the urine be strongly acid and liable to precipitation of uric-acid crystals, the administration of small doses of some alkaline drug or spring should be resorted to to diminish the acidity and render the urine limpid.

The gouty attacks are treated by rest, somewhat reduced *régime*, anodynes, if necessary, and colchicum; in the free intervals the resin of guaiac will be of use. The stiffness of the gouty joints and the tophi are treated by the dielectric introduction of lithia, by the hot-air bath, and by massage.

A visit to some spring where the application of hot baths, douches, and massage are combined with the use of some aerated spring and good vivifying air will

be of use to restore the forces and the spirits of the patient. Also a sojourn in some dry and hot climate is advisable as well for the specific gouty symptoms as for the disease of the kidneys, which is the constant companion of gout.

The obscure symptoms of the so-called visceral gout require very different treatment after their nature, but in all cases it must be remembered that gout is only to be treated successfully when great care is given to the dietetic and hygienic treatment of the whole system. This cannot be regulated by one common rule, but it must be carefully adapted not only to each patient, but to the different stages and periods of the malady.

F. LEVISON,
Copenhagen.

GRAND MAL. See EPILEPSY.

GRANULAR KIDNEY. See KIDNEYS, DISEASES OF.

GRANULAR LIDS. See LIDS, DISEASES OF.

GRAVES'S DISEASE. See EXOPHTHALMIC GOITRE.

GRINDELIA.—Grindelia is the leaves and flowering tops of *Grindelia robusta* and *Grindelia squarrosa*, which are herbaceous perennial plants indigenous to Mexico and the Pacific coast of the United States. They contain a resin, a volatile oil, and an alkaloid (grindeline).

Preparations and Doses.—Grindelia (leaves and tops), $\frac{1}{4}$ to 1 drachm.

Extract of grindelia, fluid, $\frac{1}{2}$ to 1 drachm.

Physiological Action.—Grindelia has an acrid, bitter taste. When chewed it excites the secretion of saliva. It is an antispasmodic, motor depressant, and

has light expectorant and diuretic action. It slows the heart and increases the blood-pressure. It stimulates the bronchial membrane and the kidneys, and is eliminated by them. When given in large doses, it induces paralysis of the peripheral sensory nerves, the sensory centres in the spinal cord, and later the motor centres and nerve-trunks; the pupils become dilated and renal irritation is produced.

Literature of '96-'97-'98.

In warm-blooded animals the phenomena which *grindelia robusta* produces may be ascribed to an exciting action upon the bulbar centre of the pneumogastric, which, when a large dose is introduced at one time into the circulation, appears to be paralyzant. The effects upon blood-pressure are that with small doses there is a slight rise, which is more evident with medium doses; but as the amount is increased the pressure gradually and continually falls during the same time that the oscillations are shorter. When its effects on the pneumogastric are considered and also its power of contracting bronchial muscles and its action on the heart it is likely, in proper doses, to be of value as a remedy for the symptom of asthma. The drug contains an active principle, likely terpene, which benefits the associated catarrh. The drug apparently possesses a paralyzing action on the thermogenic centre. The secretions are changed as follows: The urine is increased by small and diminished by large doses, partly from changes in blood-pressure and partly from direct action on the renal epithelium. The saliva and bile are increased. Both urine and saliva are of greenish tinge. Luigi d'Amore (*Giornale della Associazione Napoletana di Medici e Naturalista*, Puntata 5a e 6a, p. 331, '96).

Therapeutics.—Spasmodic asthma and bronchitic dyspnoea may be relieved by the fluid extract of grindelia in doses of $\frac{1}{4}$ to 1 fluidrachm, every three or four

hours, given preferably in a little sweetened water or milk. In recurrent asthma it often affords prompt relief, but it does not prevent the return of the paroxysms. It is also beneficial in spasmodic coughs, pertussis, chronic bronchitis, and in hay fever. The leaves of *grindelia* soaked in a solution of nitrate of potash and dried may be burned or smoked, and the fumes inhaled.

Literature of '96-'97-'98.

In emphysema *grindelia robusta* facilitates the respiration and expectoration. In simple cardiac hypertrophy and in dilatation it has all the advantages of *digitalis* without any of its drawbacks. It relieves pulmonary congestion and the palpitation associated with cardiac hypertrophy, emphysema, asthma, and incipient tuberculosis. The following formula is useful:—

R Tincture of *grindelia*, 6 parts.

Tincture of *convallaria*, 2 parts.

Tincture of squill, 1 part.

Fifteen drops three times a day.

Huchard (*Jour. de Méd. de Paris*, No. 16, '98).

In chronic cystitis it gives relief by stimulating the mucous membrane of the bladder. The fluid extract diluted with water (1 to 10) is a very valuable lotion in poison-oak or poison-ivy eruption, and in pruritic skin affections.

C. SUMNER WITHERSTONE,

Philadelphia.

GRIPPE, LA. See **INFLUENZA.**

GUAIAIC.—Guaiac-wood (*guaiaci lignum*, U. S. P.) is the heart-wood of *Guaiacum officinale* (*Lignum vitæ*). It is employed as scrapings or chips, of olive, brown, or yellow color, very hard, and having a faint, aromatic odor and a pungent acrid taste. It enters into the composition of the compound syrup of sarsaparilla. The wood furnishes a resin

(*resina guaiaci*, U. S. P.) which is brittle and breaks with a bright, lustrous fracture. Its odor and taste are the same as that of the wood. Its powder is grayish, but becomes green on exposure to the air. It is soluble in alcohol, ether, and alkaline solutions, but very slightly so in water. Guaiac resin is an ingredient of Plummer's pills (*pilulæ antimonii compositæ*, U. S. P.).

Preparations and Doses.—Resin of guaiac, 10 to 30 grains.

Tincture of guaiac, $\frac{1}{2}$ to 1 drachm.

Tincture of guaiac, ammoniated, $\frac{1}{2}$ to 1 drachm.

Physiological Action.—Guaiac taken internally causes a sense of warmth in the stomach, and increases the secretion of the digestive fluids. In large doses it gives rise to gastro-intestinal irritation and produces active purgation. A well-marked rash, attended with great itching and resembling that of *copaiba*, sometimes follows the use of guaiac.

Best use of guaiac is as a laxative or purgative. In one case in which this drug was prescribed a well-marked rash, resembling that of *copaiba*, covered the arms and legs of the patient. It was accompanied by intense itching, and disappeared upon the withdrawal of the drug. William Murrell (*Medical Bulletin*, Jan., '91).

Literature of '96-'97-'98.

Guaiac possesses none of the properties which are essential to its use as a laxative: the dose required to produce the desired effect is too large to be safe or agreeable, and the action of the drug in this direction altogether too uncertain. Combemale (*Rev. Inter. de Méd. et de Chir.*, Feb. 25, '96).

Therapeutics.—Guaiac given early in a 30-grain dose, either in powder or in emulsion with the white of egg, will often abort an attack of acute tonsillitis or of acute pharyngitis. Rheumatism of

subacute or chronic type, gout, and rheumatic pharyngitis may be relieved by the administration of either the tincture or the ammoniated tincture of guaiac; but, on account of its disagreeable character, other remedies are preferred.

Literature of '96-'97-'98.

Guaiac is valuable in many gouty and rheumatic conditions. It possesses the following advantages: 1. It is innocuous, and may be taken for an indefinite length of time. 2. It possesses considerable power, but less than colchicum, in directly relieving patients suffering from gouty inflammation of any part; it may be given whenever there is but little fever. 3. Taken in the intervals of gouty attacks, it has a considerable power of averting their occurrence; in fact, it is a very powerful prophylactic. 4. It does not seem to lose its prophylactic power by long-continued use. 5. There are a few patients who cannot continue its use. Guaiacum does not affect the formation of uric acid, but acts directly on the kidneys as a stimulant, enabling them to get rid of any accumulation in the tubules, thus preventing absorption from them into the blood. Sir Alfred Garrod (*Med. Rec.*, July 4, '96).

AMENORRHOEA.—In amenorrhœa not associated with anæmia, the administration of 10 grains of guaiac, stirred in milk, before breakfast, will give good results if continued for some weeks. Painful menstruation may be relieved by the ammoniated tincture in doses of $\frac{1}{2}$ to 1 drachm every two or three hours.

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Philadelphia.

GUAIACOL.—Guaiacol (monomethylcatechol, methyl-ether of pyrocatechin; methylpyrocatechin) is a highly-refractive, colorless, oily liquid, having a characteristic aromatic, agreeable odor, and is obtained by fractional distillation from beech-wood creasote. It may also be ob-

tained by the dry distillation of guaiacum, or produced synthetically by the action of methyl-sulphuric acid upon pyrocatechin. It is freely soluble in alcohol, ether, and carbon disulphide, and in 85 (Helbing) or 200 (Merck) parts of water. It also occurs in colorless crystals, which are freely soluble in glycerin, alcohol, ether, and slightly soluble in water. It forms salts with the acids; the carbonate and salicylate is a white, insipid crystalline substance, with the odor of salol, and soluble in alcohol.

Iodoguaiacol is best prepared by adding 62 grains of iodine to $8\frac{1}{4}$ drachms of guaiacol and applying a gentle heat. After the iodine is dissolved, 50 ounces of pure olive-oil are added. W. H. Gregg (*N. Y. Med. Jour.*, Nov. 21, '91).

Attention called to a new pulmonary antiseptic, which is obtained from guaiacol by the action of caustic soda; the sodated guaiacol thus formed being afterward precipitated by a watery solution of sodated iodine, a guaiacol biiodide is obtained. The new drug occurs as a brownish-red powder, soluble in alcohol and in the oils. Vicario (*Revue Inter. de Bibliographie*, Mar. 25, '92).

Although guaiacol has hitherto been described as a liquid, the pure synthetic product is a solid body, crystallizing in colorless prisms, which melt at 83.3° F., boiling taking place at 369° F. It is readily dissolved in pure, undiluted glycerin, the solubility in water being only 1 to 50. Liebreich (*Ther. Monats.*, May, '93).

Crystals of pure guaiacol are white and hard. When melted, the guaiacol remains in fusion for an indefinite time. It is soluble in most of the organic solvents, even in benzin; it is also soluble in petroleum-ether, and crystallizes very well on the evaporation of this solvent. Anhydrous glycerin dissolves crystalline guaiacol in large proportions. Gilbert and Morat (*L'Union Méd.*, p. 753, '93).

Absolutely-pure, crystalline guaiacol has little taste or smell. It can be obtained in an absolutely-pure condition

from a commercial sample by cooling with a mixture of ice and salt, and then separating the crystals which have formed. S. Winghoffer (*Pharm. Zeit.*, No. 34, '94).

Preparations and Doses.—Guaiacol (liquid), 2 minims, gradually increased to 16 minims.

Guaiacol (solid), 12 grains, gradually increased to 15 grains.

Guaiacol-carbonate, 3 to 8 grains, increased to 90 grains.

Guaiacol-cinnate (styracol), 5 grains.

Guaiacol-salicylate (guaiacol-salol), 15 grains; maximum daily dose, 150 grains.

Guaiacol-benzoate (benzoyl-guaiacol; benzosol), 3 to 12 grains.

Guaiacol-biniodide, 2 grains, increased to 15 grains.

Physiological Action.—The physiological action of guaiacol is similar to that of its congener, creasote, although its effects on the gastro-intestinal tract are not so irritating. The respiration and pulse are only temporarily affected. The blood-pressure is slightly increased, and there is slight contraction of the arterioles. Large doses produce a burning sensation in the stomach, nausea, etc.: symptoms of gastro-intestinal irritation. Guaiacol is excreted principally by the kidneys, as guaiaco-sulphuric ether, but also by the skin and the salivary glands, and in small measure by the lungs.

Guaiacol administered by the alimentary tract is only partly absorbed. It is more readily absorbed in healthy than in sick persons. For its absorption it is sufficient to give it in daily doses of $7\frac{3}{4}$ grains. Administered in such doses, it does not cause nausea, and is well borne by patients. Guaiacol is not eliminated as such by the urine, but in the form of a body giving the reaction of phenol. Poggi (*Riforma Medica*, Aug. 10, '92).

The effect produced by guaiacol is not due to its action on the digestive organs. In combination with the blood guaiacol

has no such action. The medicament is eliminated as a salt of ethyl-sulphuric acid, and thus, when absorbed into the blood, it must have combined with albuminous bodies, and chiefly through the sulphur present in the albumin molecule. In the blood of phthisical patients there are, in addition, other albuminous bodies, namely: the products of the growth of the bacilli. The absorbed guaiacol combines with these products and renders them harmless, and they are further changed by oxidation, the guaiacol being liberated as a salt of ethyl-sulphuric acid, and the other decomposition products being eliminated in the urine. Hollscher and Seifert (*Berliner klin. Woch.*, Jan. 18, '92).

Guaiacol acts by influencing the peripheral ends of nerves, and, through them, the thermogenic centre, on its application to the skin. The presence of guaiacol in the urine is attributed to the absorption of the vapors through the respiratory organs. The influence of guaiacol is chiefly seen in febrile conditions. Guinard (*Bull. Gén. de Ther.*, Oct. 30, '93).

After painting the skin with 31 grains of guaiacol, elimination by the kidney is manifested in a quarter of an hour; the proportion in the urine is greatest in from one and a half to four hours after and reaches 50 grains per quart. It decreases rapidly in six or seven hours, and in twenty-four hours there is no further trace in the urine. It is necessary in external application of the drug to cover the painted surface with an impermeable layer of taffeta. Linossier and Lannois (*La Méd. Moderne*, Feb. 7, '94).

Pure guaiacol passes rapidly into the urine, while after the application of a mixture with glycerin it appears much more slowly. Almond-oil interferes much less with absorption than glycerin. Stourbe (*Lyon Méd.*, July 15, '94).

Poisoning of Guaiacol.—A case of poisoning, in a child 9 years of age, has been reported by Wyss, in which $1\frac{1}{4}$ drachms were accidentally taken. In a short time she became unconscious and cyanotic. The conjunctivæ became in-

jected, the corneal reflexes diminished, and the pupil contracted and inactive. Vomiting (ejecta had odor of guaiacol) and profuse salivation were present. The pulse became rapid and weak and the breathing irregular. Cutaneous sensibility was diminished. Later on blood and bile-stained mucous were vomited. The urine was dark colored, of an aromatic odor, and contained bile-pigments and a small amount of albumin. The cyanosis gradually diminished and was followed by a deadly pallor. The respirations became frequent. Jaundice appeared and the patient died on the third day. The autopsy revealed an acute gastro-enteritis and parenchymatous degeneration of the liver and heart-muscle, acute hæmorrhagic nephritis, enlarged spleen, and ecchymosis in the pleura, peritoneum, endocardium, and pericardium. Several cases of death have been reported following the hypodermic administration of guaiacol, the patients dying within an hour in profound coma with every symptom of cardiac paralysis.

Even when ingested in toxic quantities, the drug is but slightly eliminated by the expired air. Small amounts of the drug, however, may be met with in the lung-tissue. Paul Binet (*Revue Méd. de la Suisse Rom.*, June, July, '93).

After $15\frac{1}{2}$ -minim doses of guaiacol, slight appearances of poisoning may supervene. These are characterized by a burning feeling in the stomach, nausea, etc. Kobert ("Intoxicationen," '94).

Fifteen and a half minims of a mixture of guaiacol, 150 parts, and iodoform, 20 parts, injected into the knee-joint of a girl of 8 years suffering from fungous arthritis. Cyanosis, dyspnoea, loss of consciousness, nausea, and temporary amaurosis supervened. Von Mosetig-Moorhof (*Deutsche med. Woch.*, No. 7, '94).

Treatment of Guaiacol Poisoning.—Soluble sulphates (Epsom or Glauber's

salt) may be given freely in conjunction with mucilaginous drinks. Digitalis and strychnine hypodermically injected are useful, associated with heat to the extremities and counter-irritation applied on the abdomen. Emetics and the stomach-pump are valuable if used early, before the drug has been absorbed.

Therapeutics.—Guaiacol has been chiefly used as a remedy in tuberculosis, as an antipyretic in fevers. It may be given in pill, in capsule, in an alcoholic or oily solution, or by hypodermic injection, dissolved in sweet almond-oil (equal parts), or in sterilized neutral olive-oil (1 to 5). Liquid guaiacol may be administered by inhalation, its volatility adapting it for that purpose. It may also be given by inunction; the part being cleansed and dried, the guaiacol is painted over the surface, and after being left for about ten minutes the part is well rubbed and covered with some impermeable dressing. Its absorption is very rapid, guaiacol being found in the urine fifteen or twenty minutes after it is applied to the skin.

External applications of guaiacol increase the utilization of albuminoids by the organism and absorption of fat and diminish oxidation. Caporali (*Riforma Medica*, No. 175, '94).

TUBERCULOSIS.—In the early stage of this disease guaiacol reduces the fever, restores the gastric and intestinal functions, and improves the condition of the patient.

In tuberculosis $\frac{1}{2}$ to $2\frac{1}{2}$ drachms applied to the extremities, back, and abdomen, and covered with cotton and gutta-percha. The action of the drug is manifested even in fifteen minutes. There is no irritation of the skin if the drug is of pure quality. S. Sciolla (*Deutsche med. Woch.*, No. 22, '93).

Four cases of tubercular disease in which the local application of guaiacol caused a marked reduction of the temperature. Guaiacol may be painted over

the thigh or the back, the part being covered with an impermeable towel. Dosage can thus easily be managed. The quantity at the beginning was $\frac{3}{4}$ drachm, this amount being decreased at each treatment. The antipyretic action of guaiacol, employed as described, is not confined to tuberculous cases, but has given the same satisfactory results in pyrexias of erysipelas and pneumonia. L. Bard (Lyon Méd., June 4, '93).

The principal results of clinical research may be summarized as follows: 1. Guaiacol is an excellent antipyretic. 2. The drug does not give rise to collapse, even in phthisical subjects with large cavities. In these patients, however, the application is almost invariably followed in from two to four hours by perspiration and rigors. 3. Compresses are the best mode of application. 4. Chemically-pure crystalline guaiacol should be preferred to the ordinary fluid preparation. S. T. Bartoszewicz (Xujno-Ruskaia Med. Gazeta, Nos. 23, 24, '91).

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Carbonate of guaiacol, a 20-per-cent. solution in olive-oil, recommended in all forms of cystitis, but especially in the tuberculous variety. From 15 to 30 minims to be used once or twice a day; the addition of iodoform, 1 per cent., increases the efficacy. Colin (Jour. de Méd., Jan. 26, '96).

Schetelig's method of giving pure guaiacol subcutaneously in acute pulmonary tuberculosis tried; 3 hypodermic doses, 1 of 15 minims and 2 of 10 minims, at four hours' interval, in one case brought the temperature from 104° to normal, with rapid amelioration of all the symptoms. Guaiacol is especially useful in the fever of the suppurative stage of the disease. A moderate perspiration usually follows the injection. Coghill (Brit. Med. Jour., Mar. 7, '96).

From 1 to $1\frac{1}{2}$ drachms of the following solution may be injected at a dose without danger:—

R Iodoform, 15 grains.

Guaiacol, 75 grains.

Sterilized olive-oil, 3 ounces.—M.

There were 424 injections given to eighteen patients suffering from pulmo-

nary tuberculosis; the effects are distinctly favorable. The injections should be given into the loose connective tissues of the back, shoulder, or thigh.

Careful asepsis should be maintained. A. Breton (Jour. des Praticiens, Dec. 19, '97).

The action of guaiacol injections in surgical tubercle studied. The liquid is used as a 1-in-10 to 1-in-20 solution in sterilized olive-oil. Rigid antiseptic precautions are required for the injections, the latter being made with a Roux syringe deeply into the granulation-masses, $\frac{1}{2}$ to 1 cubic centimetre of the solution being injected at three or four different points. This may be repeated once or twice every week, provided there has not been much irritation.

Number of observations of white swelling, etc., in which an extremely favorable result was obtained.

Guaiacol may also be used in the form of a dressing in certain open tuberculous conditions: thus gauze steeped in guaiacol solution (in olive-oil 1 in 10) and applied to the surface causes decrease of pain and the healthy condition of the tissues. Grégoire (Thèse de Paris, '97).

FEVER.—Guaiacol possesses strong antipyretic powers. It is perhaps best used by painting over the skin of the abdomen, the chest, or the internal aspect of the thigh, 30 or 40 drops being used for this purpose, as described above. These applications may be repeated. The decline in temperature is often great and rapid, but after reaching the lowest point the temperature will more rapidly attain its former height. A great feeling of depression is experienced by the patient and profuse sweating occurs. The temperature has reached the minimum, and chills at this time are not uncommon. The use of this drug for its antipyretic effect is not devoid of danger, and its action is not as lasting as that produced by the cold bath and by numerous other antipyretic remedies. Guaiacol-carbon-

ate has been used in typhoid fever, for its antiseptic action in the bowel, but such use is not to be advised.

Applications of guaiacol over the spleen recommended in intermittent fever where quinine is not well borne or as an adjunct to the latter drug. Kohos (*Gaz. des Hôp.*, Oct. 30, '94).

Guaiacol mixed with tincture of iodine used in the treatment of pleurisy, in the following proportions: Tincture of iodine, 385 grains; guaiacol, 75 grains. The chest is thoroughly painted with it every night. The application is followed by a fall of the temperature, profuse perspiration, diuresis, and by a resorption of the fluid. Casavovici and Miron Sigalea (*N. Y. Med. Jour.*, Mar. 3, '94).

Guaiacol applied externally is readily absorbed; its application is followed in most instances of fever by a gradual reduction in temperature, which reaches its lowest point between three and four hours after the application; the fall of temperature is almost always associated with profuse sweating; at a variable period, usually a short time after the lowest point is reached, the temperature rises rapidly, generally with marked chilly sensations, if not with an actual chill; the amount applied should rarely exceed $\frac{1}{2}$ drachm. Similar results follow the absorption of guaiacol through any other channel. Owing to the weakening effects of its continued use and the disagreeable effects of its immediate application, its use as an antipyretic will be very limited. Thayer (*Med. News*, Mar. 31, '94).

Guaiacol has more effect in modifying the temperature about the beginning than toward the end of the acute fever. C. A. Dana (*Med. Record*, June 22, '94).

On painting the skin with guaiacol in a case of typhoid fever, the temperature fell from 105.4° to 98.6° F. in three and a half hours without any disturbance of the circulatory or nervous system. Afterward the drug was used about twice daily, a fall of temperature occurring each time. The antipyretic effect is slower than that of the bath, but more permanent. After washing with soap and water, 30 drops should be slowly rubbed

in the skin of the abdomen or thigh or painted over the surface, then covered with lint or wax-paper. Fifty drops should be a maximum amount. The urine should be watched carefully. The unpleasant odor caused by the drug may be to some extent overcome by the addition of oil of cloves. Da Costa (*Med. News*, Jan. 27, '94).

This drug has a powerful antipyretic action. In all cases the reduction of temperature is accompanied by profuse diaphoresis, which may or may not be accompanied by a chill or chilly sensation. Great exhaustion is frequently produced. The effects may be obtained from 30 to 50 drops, and great care should therefore be exercised, the drug being applied but once or twice daily, the initial dose not exceeding 30 drops. Its effect differs from the stimulating cold bath in being depressant. The main indication for its use is in diseases accompanied by high fever in which the cold bath cannot be applied, as well as in all other diseases accompanied by high fever in which irritability of the stomach prevents the use of other antipyretics. Friedenwald and Hayden (*N. Y. Med. Jour.*, Apr. 14, '94).

Use of guaiacol not recommended, as, although the fall of temperature is very marked, the sweating and rigors are very severe, and the influence on the disease is not lasting. Stolzenburg (*Berliner klin. Woch.*, Jan. 29, '94).

The external application of guaiacol may be dangerous, first, by the sudden fall of temperature which immediately follows the application, and, second, by the nervous depression produced by repeated applications. In typhoid fever the method should not be employed on account of the long duration of the disease; in erysipelas and pneumonia, on the other hand, it is very useful. In tuberculosis its effect is favorable only in a certain number of cases of interstitial granular formations without complications. Baird (*La Semaine Méd.*, Aug. 17, '95).

Guaiacol internally excellent as an antiseptic in the typhoid fever of children. The following formula employed:

R Guaiacol, 1 drachm.
Glycerin, 2 drachms.
Alcohol, 2 drachms.

M. Sig.: 1 to 6 drops in whisky and water every two hours, according to the age.

This treatment is continued throughout the course of the disease, the dose of guaiacol being increased or decreased according to the severity of the symptoms. Under this plan of treatment intestinal antiseptics is evidenced by the slight degree of tympanites, absence of sordes, and especially by the character of the stools, which are much less frequent and practically destitute of the very disagreeable odor that characterized the passages of patients before the introduction of treatment directed toward intestinal antiseptics. König (*Jour. Amer. Med. Assoc.*, Oct. 5, '95).

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Guaiacol deemed by many to be a depressant and a dangerous remedy where the circulation has suffered from long-continued fever. The writer has used it in a number of cases of typhoid fever with only the happiest results. When given internally guaiacol does not reduce the temperature to the same degree as when applied to the skin. McCormick (*Brit. Med. Jour.*, Mar. 7, '96).

Guaiacol used in the treatment of malarial intermittent fevers; 15 minims were rubbed into the axilla and covered with cotton. The average fall of temperature in $\frac{3}{4}$ hour was 1.6° , in $1\frac{3}{4}$ hours 2.3° , and after 4 hours the average fall was 3° . The fall of temperature was accompanied by a free perspiration and a marked improvement in the condition and comfort of the patient. No depression was noticed. Rogers (*Ind. Med. Gaz.*, Jan., '98).

Remarkable success with guaiacol in many cases of cough of long standing, in which no tuberculous element could be recognized. A. Goldhammer (*Med. Record*, Oct. 23, '97).

Eleven cases of serous pleurisy treated with a mixture of guaiacol, 1 part, and tincture of iodine, 4 parts, with favorable results. A drachm of this mixture

was applied once daily to the affected side, which was then covered with wax-paper, cotton, and then with a bandage. Besides this treatment the patients received only small doses of codeine or Dover's powder. In all cases the exudate became absorbed more quickly than was observed by the author under any other method of treatment.

By irritating the peripheral nerve-endings the guaiacol acts on the thermal and vasomotor centres; hence the reduction in temperature and increased absorption-power of the pleura. Besides, it acts in the blood-current directly as an antiseptic. Brosorowsky (*Medizinskoje Obosrenije*, No. 1, '98).

PAINFUL DISORDERS.—The analgesic effects of guaiacol have been utilized in the treatment of arthritis deformans, acute articular and muscular rheumatism, sciatic coxalgia, and pains of a superficial or deep-seated nature. The pains of orchitis and epididymitis are relieved by applying guaiacol in oily solution or in ointment (1 part to 10 or 15 of vaselin or lanolin).

When analgesic effects only are sought, the guaiacol should be used with equal parts of glycerin; but if it be desired to produce an antithermic action, the drug ought to be used pure or else mixed with some vehicle that lends itself readily to dermic absorption. Ferrand (*Provincial Med. Jour.*, July 2, '94).

In the treatment of epididymitis, an ointment composed of 2 to 5 parts of guaiacol and 30 of vaselin used with advantage. These good results may be explained by local action exercised upon the cutaneous nerve-endings, and the reflex action upon the cord and testicle, rather than by the absorption of the drug. Balzer and Lacour (*Le Bull. Méd.*, Apr. 11, '94).

Guaiacol recommended in cases of gonorrhœal orchitis. Crystalline guaiacol after previous melting may be applied to the affected part and to the groin by a brush; 31 to 46 grains may be used each time. A guaiacol ointment may be made thus:—

R Guaiacol, $1\frac{1}{4}$ drachms.
Vaselin, $1\frac{2}{3}$ ounces.

Tavitian (*Revue Gén. de Clin. et de Théor.*, Mar. 30, '95).

Guaiacol used to relieve pain in acute articular rheumatism, tubercular caries of the wrist, hysteria, locomotor ataxia, arthritis deformans, with excellent results and without the development of disagreeable symptoms. The painful part is first cleaned, then from 0.75 to 1.5 cubic centimetres of guaiacol are rapidly applied with a camel's-hair brush. After employing gentle friction the part is covered with a piece of gutta-percha. In some cases relief was permanent; in others the pain returned the next day. Brill (*Centralb. f. innere Med.*, Nov. 24, '94).

Good results obtained in sciatica and intercostal neuralgia from painting a mixture of equal parts of guaiacol and glycerol over the course of the nerves. No ill effects were noted. Ferrand (*Jour. des Prat.*, No. 30, '94).

Guaiacol recommended in pultaceous angina, phlegmonous tonsillitis, etc., in which diphtheria does not play any rôle. Equal parts of glycerin and guaiacol for adults; 2 parts of glycerin and 1 of guaiacol for children. Affected parts to be painted four times in twenty-four hours, making the last application late at night and the first early in the morning. Darbouet (*Jour. de Méd. et de Chir. Prat.*, Jan. 10, '95).

Literature of '96-'97-'98.

Results from the use of guaiacol in 52 cases of epididymitis, 50 of which were of gonorrhœal origin. A 10-per-cent. ointment made with vaselin or a 5-per-cent. used if the skin of the scrotum is tender. The scrotum is first washed with soap and with ether. This ointment is applied during the acute stage, and in from three to five days the fever, pain, and swelling disappear. In subacute stages the action of guaiacol is less active and very slight in chronic cases. After the acute stage it is best replaced by a 1- or 2-per-cent. ointment of extract of belladonna, with equal parts of simple ointment and unguentum diachyli. Salol internally, 15 grains *ter die*, is a useful

adjunct to the treatment. Lenz (*Wiener klin. Rundsch.*, Nos. 4, 5, 6, '98).

ANÆSTHESIA.—As an anæsthetic guaiacol may be used in minor surgical operations. A dose of 1 or 2 drops dissolved in sterilized olive-oil is sufficient to obtain anæsthesia; five minutes should be allowed to elapse after the injection. Championnière considers guaiacol superior to cocaine, because much larger doses may be used with safety. No accidents were noticed except slight sloughing of the gums where it had been used for the extraction of teeth, which he attributed to a faulty method of injection or to a defective solution.

Guaiacol recommended as a local analgesic. Applied to burns in solution, 10 per cent., in olive-oil, it causes a disappearance of the pain. It has been used with absolute success in the extraction of teeth. Anæsthesia is less rapidly produced than with cocaine, being complete only after seven or eight minutes; on the other hand, however, it appears to be much more durable. Anæsthesia is induced even in inflamed tissue. Lucas-Championnière (*Le Bull. Méd.*, July 31, '95).

As a local anæsthetic in ocular operations guaiacol recommended as vastly superior to cocaine in benumbing sensation. A solution of pure oil of guaiacol, 1 part, to sterilized olive-oil, 15 parts, is free from noxious effects. Anæsthesia appears in from 8 to 10 minutes after its use and continues 25 to 30 minutes; 2 or 3 drops are sufficient for most operations. Bellencoutre (*Jour. de Méd. de Paris*, Dec. 22, '95).

Literature of '96-'97-'98.

A 5-per-cent. solution of guaiacol upon a pledget of cotton may be applied to the nose, causing complete anæsthesia, and it may be used in the ear when performing paracentesis. Newcomb (*Amer. Med.-Surg. Bull.*, May 16, '96).

Guaiacol-oil is made by purifying olive-oil with chloride of zinc, then washing with alcohol and maintaining for some

time at 100 degrees. The solution to be used is 20 per cent.

The method of procedure for the nose and throat is to apply the solution several times to the affected part by means of a piece of cotton-wool impregnated with the oil, and for the ear it is advised to instil 5 or 6 drops of tepid guaiacol-oil, after practicing a preliminary injection of tepid water, followed by the application of "phenosalyl." After instilling the drops, a plug of cotton-wool is inserted to absorb the redundant liquid. The anæsthesia takes longer to obtain with this agent than with cocaine, and no retraction of the tissues occurs.

Guaiacol-oil is equal to cocaine in its analgesic properties, while the danger of the shocks is absent. Laurens (Ann. Mal. de l'Oreille, Jan., '96).

Guaiacol recommended as a substitute when cocaine is contra-indicated. Used 36 times in the nose, pharynx, and larynx, and on the average obtains anæsthesia in 10 minutes. The following solution recommended: To olive-oil add 10 per cent. of dry zinc sulphate; heat over a water-bath one hour and add 12 1/2 per cent. absolute alcohol; shake several times during twenty-four hours; decant and add 5 per cent. guaiacol. W. G. Holloway (Internat. Med. Mag., June, '96).

ERYSIPELAS.—Guaiacol dissolved in alcohol or oil has been employed as an application in this disease. Twenty or 30 drops may be painted over the infected area and slightly beyond. The pain is promptly relieved and the temperature lowered by this method of medication.

C. SUMNER WITHERSTINE,

Philadelphia.

GUARANA.—Guarana is a dried paste, consisting chiefly of the crushed or pounded seeds of *Paullinia cupana* (*Paullinia sorbilis*): a climbing plant in the eastern part of South America, and especially in Brazil. It contains an alkaloid, guaranine, which is identical with caffeine, and theine. Guarana is

slightly soluble in water as well as in alcohol.

Preparations and Doses.—Guarana, 1/4 to 2 drachms.

Extract of guarana, fluid, 1/4 to 2 drachms.

Physiological Action.—Guarana has a slightly bitter and astringent taste. It contains sufficient tannin to give it a slight astringent action. Farther than this, its physiological action is that of caffeine.

Therapeutics.—It is most frequently given for sick headaches or migraine. It is especially recommended when the pain affects the right side of the head. It shortens the attacks and increases the interval between them. From 30 to 60 grains of the powder, or an equivalent of the fluid extract, may be taken every night and every three hours during the attack. It is also given as a tonic when nerve-action is impaired, as in convalescence from acute disease, debility, etc.

C. SUMNER WITHERSTINE,

Philadelphia.

GUNSHOT WOUNDS OF ABDOMEN.
See ABDOMEN.

GUNSHOT WOUNDS OF BRAIN. See WOUNDS.

GUNSHOT WOUNDS OF THE HEAD.
See WOUNDS.

GUNSHOT WOUNDS OF THE JOINTS. See WOUNDS.

GUNSHOT WOUNDS OF THE SPLEEN. See WOUNDS.

GUNSHOT WOUNDS OF THE STOMACH. See WOUNDS.

H

HÆMATOPORPHYRINURIA.

Definition.—Evacuation of urine containing hæmatoporphyrin, *i.e.*, a coloring matter resembling hæmatin, but containing no iron.

Symptoms.—The urine is dark-red or brown (resembling port-wine). The ordinary reactions for hæmatin or hæmoglobin do not give positive results. Examination by means of the spectroscope reveals characteristic absorption-bands.

Etiology. — Hæmatoporphyrinuria is the consequence of prolonged use of sulphonal.

F. LEVISON,
Copenhagen.

HÆMATOSALPINX. See OVARIES,
DISEASES OF.

HÆMATURIA.

Definition.—Evacuation of urine containing blood.

Symptoms.—Urine containing but a little blood may not give any indication of its presence to the naked eye; but, when the quantity is larger, it presents a characteristic smoky appearance; when more abundant the fluid has a more or less pink or red color, while the surface presents a tinge of green; in extreme cases it looks almost like pure blood. After a time a brownish or grayish, gum-mous, flocculent sediment is deposited. When the blood is abundant it often separates from the urine in distinct clots. Although the appearance of the urine is very characteristic, various other coloring matters may be contained in the urine and give rise to delusions. These are phenol, santonin, bile-pigment, the coloring matter of rhubarb, senna, etc.

Attention called to the hæmaturia which not infrequently follows the too-free use of rhubarb. The origin of the hæmorrhage in these cases is due to actual renal lacerations in the excretion of the crystals of oxalate of lime, in which substance this plant is particularly rich. Boyd (Lancet, Oct. 24, '91).

TESTS.—The presence of blood may be proved by different tests.

1. *Heller's Test.*—A few cubic centimetres of urine are rendered alkaline with caustic soda and heated in a test-tube to the boiling-point; when blood is present the fluid becomes dark green; the phosphates are deposited as a flocculent sediment carrying with them the coloring matter of the blood by which they are colored red, or, rather, rusty brown. The alkaline solution of hæmoglobin is dichroitic; it shows a green tinge in thin layers and a red in larger ones, while in the alkaline solution of santonin the coloring matter of rhubarb, senna, etc., are not dichroitic and take on a violet hue after a time.

2. *The Guaiac Test (Almén-Schönbein).*—One cubic centimetre of recently-prepared tincture of guaiac is carefully mixed with an equal volume of ozonized oil of turpentine, *i.e.*, turpentine-oil which has for some time been exposed to the influence of air. The mixture is cautiously poured upon the specimen of urine to be tested and will superpose itself forming on the point of contact a gray or greenish layer; when blood is present a beautiful indigo-blue stratum will appear immediately above the gray ring; when shaken the mixture will take a light-blue color. The guaiac test is very delicate, indicating blood in the proportion of 1 to 2000 or more.

3. *The Hæmin Test (Terchmann).*—Some of the sediment of the urine or of

the red phosphates deposited after addition of caustic soda is collected and dried. A small amount is placed on an object-glass and completely dried by slowly warming. When it is fixed on the surface of the glass, some common salt is rubbed on it, a fine hair is placed across the preparation, a few drops of glacial acetic acid are added, and the whole is covered with a cover-glass. The object-glass is slowly heated to the boiling-point of the acetic acid and then cooled. When blood is present the characteristic small, reddish-brown crystals of hæmin will appear, which are easily detected by the aid of the microscope.

4. *Spectral Analysis*.—Examination of urine containing oxyhæmoglobin in the spectroscope reveals two distinct absorption-bands between the lines *D* and *E* of Fraunhofer; recently-passed urine never contains oxyhæmoglobin, but methæmoglobin (a modification of hæmoglobin containing more oxygen than hæmoglobin, but less than oxyhæmoglobin). By decomposition of the urine or by addition of a solution of ammonia the methæmoglobin is reduced to hæmoglobin, which again forms oxyhæmoglobin when shaken with air. The methæmoglobin gives rise to the same two absorption-bands as the oxyhæmoglobin, but, besides, to a characteristic band in red, between *C* and *D*.

5. *Microscopical Examination*.—This is the most reliable test for hæmaturia. The urine is treated in a centrifugal apparatus and the sediment examined; even when the amount of blood is too small to alter the color of the urine the corpuscles of blood are easily detected by this method. Ordinarily the corpuscles are normal in appearance, but they do not accumulate in rolls; when the urine is dilute or alkaline, they are large, spherical, and almost colorless,

commonly very transparent, whereas in concentrated urine their contour is irregular and indented; in some cases the corpuscles are broken up (fragmented); in others, casts of renal tubuli formed by blood-corpuscles may be seen.

The admixture of blood to the urine may take place in the kidneys, the ureters, the bladder, or the urethra; in order to ascertain the origin of the blood, it is necessary to subdivide the urine when voided into several parts. The first portion voided may contain blood of urethral origin, and the urine last voided show none whatever.

When the portion last obtained contains much more blood than the first, the bladder probably is the seat of the bleeding. The endoscope will then generally allow the direct inspection of the bleeding-point of the mucous membrane of the bladder.

Too much value should not be placed upon so-called typical cell-elements in determining, by microscopical examination, the source of the hæmorrhage. It is often impossible to distinguish between deep urethral and vaginal cells, between the latter and superficial vesical cells. Transitional cells are often misleading, and the typical caudal cell from the renal pelvis is rarely seen. Charles Smith (Boston Med. and Surg. Jour., July, '93).

When the bleeding is caused by lesions of the ureters or of the calyces, cylindrical coagula or casts of the calyces may be found in the urine.

When the bleeding has taken place in the kidneys the blood is very intimately mixed with the urine; the corpuscles are often broken up or massed together, and casts of the renal tubes are commonly found.

Where the specific gravity of the urine is low the hæmorrhage is apt to be renal; where it is high, the lower urinary passages are usually the seat of origin.

Otis (Jour. Cut. and Genito.-Urin. Dis., Nov., '91).

Literature of '96-'97-'98.

If the bleeding is from the urethra it may ooze between the periods of micturition; if from the neck of the bladder, it is more particularly noticed at the end of micturition; if from the bladder, it is usually very abundant, persistent, and more likely to clot, and accompanied by bladder irritability; if from the kidney, the blood is generally mixed with the urine, although, if the quantity is large, characteristic urethral clots may be found. F. R. Eccles (Brit. Med. Jour., June 5, '97).

The recognition of blood-casts in the urine forms the most conclusive proof of the renal origin of hæmaturia. L. J. Harvey (Med. News, June 25, '98).

Hæmorrhage due to renal calculus is usually small in amount and appears at more or less prolonged intervals; it is increased by movements of the body, and is appreciably diminished by rest in bed. Hæmorrhage from a renal tumor is generally more profuse and less transient than from a calculus, and in some cases it is so copious as to cause marked anæmia. Unlike the hæmaturia of renal calculus, that following tumors is more likely to occur during the night while the patient is in the recumbent posture. The presence of a persistent swelling in the renal region, associated with considerable hæmaturia, is of significance, and may be held as clearly indicating the presence of a neoplasm in the kidney. Hæmaturia from tuberculous disease is frequently absent for long intervals, is seldom so severe as from stone, and is not increased by exercise. In addition to the presence of tubercle bacilli, it has been noticed that the quantity of albumin is generally in excess of that accounted for by the blood, and in the later stage, when pus appears in considerable quantity, the pus and blood are not so rapidly or so completely precipitated in the urine as in the presence of calculous pyelitis. Newman (Lancet, July 9, '98).

Etiology.—Hæmaturia is more fre-

quently observed in men than in women or children. The blood in hæmaturia may come from the kidneys, their pelves, the ureters, the bladder, or from the urethra.

Bleeding from the urethra may be caused by acute or chronic gonorrhœa, by traumatism (calculi, introduction of catheter), by polypoid excrescences, or malignant tumors. It has been observed as a result of venereal excess or as an accompaniment of the first coitus after a long period of abstinence.

Three cases of hæmaturia reported due to prostatic engorgement. Lydston (Atlanta Med. and Surg. Jour., Apr., '88).

Literature of '96-'97-'98.

Case of hæmaturia, at first paroxysmal and later more constant. Fibrous clots were frequently present, and the first portion of the urine was often more deeply colored than the later portion. An operation showed that the condition was caused by numerous small varicose veins in the prostatic portion of the urethra. Krauss (Wiener klin. Woch., July 9, '96).

The causes of bleeding from the bladder are traumatism (calculi); diseases of the bladder, acute or chronic; varicosities of the veins (vesical hæmorrhoids); ulcerations of the mucous membrane, diphtheritic or tuberculous; tumors, especially cancer of a villous and fungous nature; parasites, such as *Distoma hematobium*, or Bilharzia, and *Filaria sanguinis*: it may also occur in hæmorrhagic diathesis, in hæmophilia; and also in infectious fevers, variola, etc.

Two cases of hæmaturia of vesical origin, caused, respectively, by papilloma and epithelioma of the bladder. Hill (Lancet, May 20, '88).

Case of hæmaturia observed in a sickly boy of 9 years, due to rhabdites. The organisms were found only in the urine.

Peiper and Westphal (Centralb. f. klin. Med., Feb. 25, '88).

The invasion of *Bilharzia hæmatobia* is purely a local one: the parasite lives and breeds solely in the urinary tract, and not in the circulatory system. The condition is found especially in boys who bathe in muddy pools. The prepuce is probably the primary lodging-place of the parasite. Allen (Practitioner, Apr., '88).

Hæmaturia is a common disorder in and about Zanzibar, both among the natives and Europeans. Both parasitic and non-parasitic forms are met. All parasitic cases are directly traceable to drinking-water from two small rivers. Castle (Lancet, Apr. 25, '91).

Case of boy, 15 years of age, affected with hæmaturia from the influence of the *Distoma hæmatobium*. Besides this boy an older and a younger brother also suffered from a similar affection. Reference to the neoplastic formation caused in the bladder (and sometimes in the lower intestine) by the ova and embryos of the parasite. This view is corroborated by Virchow, who states that he had witnessed a bladder showing large polypoid excrescences caused in this manner. Nitze (Deutsche med. Zeitung, Feb. 5, '91).

Case of a married woman who had noticed blood in the urine for about six months. The hæmorrhages became so profuse that she became very anæmic and entered the hospital. Cystoscopic examination made, when it was found that the mucous membrane of the bladder was covered with an incrustation of uric-acid crystals, with sharp corners and points. They seemed to be deeply wedged in the mucous membrane, which was red and congested. Under anæsthesia a Bigelow evacuator was introduced, and with every aspiration of the pump a great number of crystals came out. This was continued until the liquid came away clear. From the moment the crystals were removed no more blood appeared in the urine. Jacob Frank (Wiener klin. Rund., xl, No. 48, p. 786).

Attention called to a rare case of extrarenal hæmaturia. The lesions which provoke the hæmorrhage appear as

ecchymoses, nipple-like prominences, discrete or grouped ulcerations, and gangrenous patches in the mucous membrane of the bladder. Létienne (La Méd. Moderne, Dec. 18, '90).

Case of intermittent hæmaturia observed, the attacks being separated by several days or several months, each lasting from several hours to fifteen or twenty days. They followed fatigue or emotion and were preceded by a painful spasmodic sensation. Twice the hæmaturia was replaced by epistaxis. The case diagnosed as hæmaturia of neuropathic origin through paralysis of the vasomotor of the cystic veins. Rho (Giornale Medico del Reale Esercito e della Reala Marina, Sept., '93).

Bleeding from the pelves or the ureters is generally caused by calculi or by tuberculous disease, also by acute infectious diseases of hæmorrhagic character; by parasites (*distoma* and *filaria*).

Bleeding from the kidneys is frequently due to irritating poisons, such as cantharides, turpentine, etc.; very large doses of quinine and salicylic acid are said to have produced renal hæmaturia. Different diseases of the renal blood-vessels may cause bleeding; for instance: embolism of the renal artery, thrombosis of the veins, aneurism; traumatism; parasites (*Distoma hæmatobium*—*Filaria sanguinis*—*echinococcus*); also more rarely acute nephritis, especially scarlatinous. In Bright's disease hæmaturia is observed also when malignant neoplasms are present. Renal hæmaturia may be caused by scurvy, hæmophilia, etc.; it occasionally accompanies infectious diseases, such as variola, morbilli, scarlatina, typhoid fever, cholera, exanthematous typhus, recurrent fevers, yellow fever, erysipelas, etc.; it is rarely seen in syphilis, but in intermittent fever it is a frequent symptom (see MALARIAL FEVERS).

Case of hæmaturia seen in a young girl. The girl had been exposed to

typhoid infection; she presently was taken severely ill, and for thirty-five days hæmaturia ran along with a high temperature, and upon the fall of fever disappeared entirely and completely. Oliver (Brit. Med. Jour., May 26, '88).

In some cases the hæmaturia is idiopathic, and is not to be explained by any of the above-mentioned etiological factors.

Hæmaturia in a male with regular monthly occurrence. This was regarded as of an essential nature, established for the relief of plethora. This condition continued for nearly a year, but finally stopped by the use of gallic acid before and during the expected period. Chapin (N. Y. Med. Jour., Apr. 6, '89).

Case of a man in whom hæmaturia came on from walking or other muscular fatigue, without any assignable lesion of the bladder, ureter, or kidney. Lannois (Lyon Méd., Dec. 20, '91).

Literature of '96-'97-'98.

Hæmaturia observed consecutive to mountain-sickness. Luzzatto (Gazz. degli Ospedali, May, 1, '98).

Prognosis.—The prognosis of hæmaturia depends on the quantity of blood lost and the gravity of the disease which causes the bleeding.

Treatment.—In all forms of hæmaturia rest and cold are the most important therapeutics; in bleeding from the urethra and the bladder cold may be applied by injections of ice-water or externally; in bleeding from the urethra compression may be useful; also astringent injections have been employed (nitrate of silver, acetate of lead, tannic acid, perchloride of iron, etc.); when the bleeding is accompanied by painful mic-turition, narcotics are recommended.

In cases of vesical hæmaturia, injections into the bladder, after it has been thoroughly cleared of blood, of $\frac{1}{100}$ solution of tannin, recommended. Donna-dieu (Med. Chronicle, July, '93).

Bleeding from the ureters, pelvis, or kidneys is treated by rest, cold, and internal medication of secale, ergotine, tannic acid, arbutin, acetate of lead, perchloride of iron, fluid extracts of hamamelis Virginica or of hydrastus Canadensis. In chronic cases of hæmaturia the balsams may be tried.

In a case of hæmaturia a successful result obtained from ergot. Bauer (Med. Chips, Nov., '88).

Method of treatment for malarial hæmaturia in which quinine does not have a part, and which has been used with entire success.

This consists of the use of oil of turpentine to stop the hæmorrhage, magnesium sulphate in $\frac{1}{2}$ -ounce doses every four hours until six large evacuations are secured, liquid nourishment, and Fowler's solution to combat the malarial element. Guice (Amer. Medico-Surg. Bull., Sept. 1, '94).

Oil of turpentine successfully used in hæmaturia and cases of hæmoptysis. Sasse (Ther. Monat., Feb., '95).

When the bleeding is caused by calculi or by tumors these are to be removed by operation, if possible; when the blood comes from the kidneys and only one kidney is diseased, it may be necessary to remove the diseased kidney; in some instances only an exploratory incision has been made, the kidney has been replaced after a careful examination by which no reason for the bleeding was found, and the operation has resulted in complete recovery. (For the treatment of malarial hæmaturia see MALARIAL FEVERS.)

F. LEVISON,
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HÆMOGLOBINURIA.

Definition.—Evacuation of urine containing the coloring matter of blood (but no corpuscles).

Symptoms.—The urine varies in color from smoky to pink or red, sometimes

almost black; the color has been compared to that of porter, coffee, or port-wine. The urine is ordinarily turbid, acid, of variable specific gravity, and highly albuminous; it deposits after some time an abundant, chocolate-colored, grumous sediment, which microscopically is seen to consist chiefly of granular hæmoglobin, mixed with renal casts, hyaline and fatty, sometimes also with crystals of hæmatoidin, uric acid, and oxalate of lime; occasionally a few corpuscles of blood may be found. The presence in the urine of hæmoglobin, or more correctly of methæmoglobin, is demonstrated by different tests, as Heller's test, the guaiac test, the microscopical examination, and spectral analysis (see HÆMATURIA). By spectral analysis two absorption-bands are found between *D* and *E* and a third between *C* and *D* of the Frauenhofer lines.

Idiopathic, or paroxysmal, hæmoglobinuria is characterized by attacks of hæmoglobinuria separated by free intervals of days, weeks, or months. Two attacks have rarely been observed in one day; they are ordinarily caused by cold, especially to exposure of hands or feet (Pavy, Muiri, Lichtheim, Rosenbach). The attacks last from three to twelve hours, and are preceded for a brief period by a chill or rigor, itching of the skin, languor, a sense of weight or dull pain over the kidneys, aching pain or stiffness in the legs, and nausea or vomiting. Shivering sets in and generally there is fever with rise of temperature to 40° C. (104° F.) and still higher. The fever continues for some hours and ends with profuse perspiration. The attacks are sometimes followed by an eruption of urticaria. The urine, which was normal before the attack, becomes dark and remains so during some hours, after which it gradually resumes its normal appear-

ance. The liver and the spleen have in most cases been found swelled and tender. After the attack the patient is very much exhausted for some time, the skin and the mucous membranes being pallid.

Study of 12 seizures of hæmoglobinuria in a man, aged 43 years, without syphilis or any tubercular taint. Of these, 8 began with a chill, 1 with fever, and 3 without prodromes. Five were caused by exposure to cold, 3 by excessive exertion, 1 by exertion and wetting, and 3 apparently without cause. The temperature rose to fever-height in 10 cases; the higher the temperature and longer its duration, the more intense the hæmoglobinuria. The staining occurred at the height of the fever. During the seizure the heart's action increased, the pulse was small, the respiration disturbed, and nervous symptoms manifested themselves. Prior (Münch. med. Woch., July 24, Aug. 7, '88).

Case of paroxysmal hæmoglobinuria due to cold. The case was peculiar in that, in summer, when the patient was free from the ordinary attacks of hæmoglobinuria, he was troubled by cerebral symptoms in the shape of disturbances of sleep, fright, hallucinations, etc. His sufferings were great, and could not be influenced by medication. L. F. Bishop (Med. News, May 16, '95).

Etiology.—Hæmoglobinuria can experimentally be caused by injection, into the veins of animals, of dissolved hæmoglobin or of substances which disintegrate and dissolve the corpuscles of blood, such as water, glycerin, and the salts of the bile-acids; the same result may be obtained by inhalations of arseniuretted hydrogen, sulphuretted hydrogen, ether and other poisons, or by ingestion of poisons such as arsenic, chlorate of potassium, etc.; transfusion of blood or serum of another species of animal also causes hæmoglobinuria.

1. In man hæmoglobinuria is caused by poisons, *i.e.*, sulphuric acid, hydrochloric

acid, arsenic, chlorate of potassium, pyrogallie acid, naphthol, nitrobenzol, poisonous mushrooms, etc.

[Carré (Bull. Gén. de Thér., '92) contends that large doses of quinine are capable of producing a condition of methæmoglobinuria. F. LEVISON.]

Sulphite of quinine, in doses of 7½ grains or more, has produced a hæmoglobinuria lasting twenty-four hours. Cinchonine or antipyrine should be employed in cases having an idiosyncrasy to quinine. Pampoukis and Chomatianos (Le Progrès Méd., July 7, '88).

Six cases observed in which hæmoglobinuria repeatedly followed the administration of quinine. Coromilas (Jour. de Méd. de Paris, Jan. 25, '91).

Case of hæmoglobinuria due to quinine, which was followed by an acute, albuminous nephritis. Kanellis (Bull. Gén. de Thér., Jan. 30, '95).

[Sharp and Summerskill observed a case of a child of 8 years (Lancet, '93) which they attribute to sewer-gas. F. LEVISON.]

Those cases of hæmoglobinuria dependent upon a hæmoglobinæmia do not occur as the paroxysmal variety, but at the beginning or in the course of certain affections, and are followed by a congestive nephritis. Robin (La Semaine Méd., May 18, '88).

Case of probable infectious origin occurred in a child, aged 2 years, who, two days after performance of ritual circumcision, sickened, developed hæmoglobinuria and jaundice, refused nutrition, presently manifested grave respiratory symptoms, and died. Baginsky (Deut. med.-Zeit., Jan. 24, '89).

Two cases of hæmoglobinuria in which the patient became suddenly ill with jaundice and hæmoglobinuria. The latter lasted three days, then the urine became normal. Jaundice and distinct swelling of the spleen continued for seven days longer and the aspect of the case in general was that of an acute infection. No micro-organism could be found in the blood; but the patient had eaten blood-sausage the evening before his illness, and it is not unlikely

that intoxication occurred in this way. Klemperer (Charité Annalen, 20, p. 131).

2. It may be caused by extensive burns, insolation, transfusion of lamb's blood and occur as a symptom of severe infectious diseases (scarlatina, typhoid fever, diphtheria, intermittent fever, icterus). Hæmoglobinuria has been observed by Winckel as a special disease of the newborn. In severe malarial fevers with icterus, hæmoglobinuria has often been noticed; these fevers occur mostly in tropical climates in the three continents; when the patient returns to a temperate climate the hæmoglobinuria ordinarily ceases; the cases may be light or severe; the severe cases end lethally either by exhaustion, by complete cessation of the secretion of urine or by causing a uræmic condition of the patient.

Case of hæmoglobinuria of hæmatogenous origin from the effects of an intra-uterine washing with carbolic acid.

On the eleventh day the patient died, after a number of rigors having appeared on different days. On section there was found a putrid endometritis and acute parenchymatous nephritis, with infarction of the urinary tubules with hæmoglobin. Krukenberg (Centralblatt für Gynäk., Aug. 1, '91).

Hæmoglobinuria observed in Roumanian cattle, ascribed to the activity of a micro-organism, a diplococcus. The diplococcus is to be met within the red blood-cells, not to any extent in the large vessels, but in certain of the parenchymatous organs. It is always found in greatest degree in the kidney, in the tufts. It does not leave the kidney in any great numbers, as a rule, but may be found in the liver and spleen, and occasionally in the vessels. The parasite apparently finds a favorable site for development in the waters of badly-kept wells and ditches, and is taken into the alimentary tract of the animal, thence into the lymphatic circulation and hæmatic system. Babès (Virchow's Archives, Jan., '89).

Case of hæmoglobinuria observed in

a rheumatic woman of 60 years. André (Le Midi Méd., Apr., '93).

Hæmoglobinuria observed in a girl of 16 years, ill four days with pneumonia. The crisis occurred on the seventh day, and at the same time the urine began to clear. Nash (Lancet, No. 3643, '93).

Typical attacks of hæmoglobinuria produced in a phthisical patient by slight cold. Brunelle (Bull. Méd. du Nord, Jan., '93).

In Greece hæmoglobinuria (of malarial origin) has an average mortality of 22.4 per cent. It is especially met with among those persons who have been long infected by the miasm. Canellis (Archives de Méd. Navale, June, '88).

Malarial hæmoglobinuria is more common in males than in females, and is rarely met among negroes. Long residence in malarial districts is necessary to development of this condition. Chambles (Med. Brief, May, '91).

Hæmoglobinuria occurs at periods of an æstivo-autumnal type, from the circumstance that the destruction of red blood-corpuscles is more extensive than in malarial seasons during spring. Bastianelli and Bignami (Riforma Med., June 7, '92).

Three cases of transient hæmoglobinuria from muscular exertion. In two the cause was a foot-race; in the third, a game of lawn-tennis. The blood was healthy, but the corpuscles were destroyed by some product of the unusual muscular exertion, probably carbonic acid. L. Dickinson (Brit. Med. Jour., May 19, '94).

Instance of hæmoglobinuria met with brought on in a young man by walking. Robin (La Semaine Méd., Apr. 18, '88).

3. Hæmoglobinuria is caused by dissolution of blood, *i.e.*, in scurvy, purpura, rubrum maculosus, variola hæmorrhagica, and may also be seen in typhus.

4. The intermittent, or paroxysmal, hæmoglobinuria is a distinct affection which has especially been studied in the last years. It has commonly been observed in men, seldom in women.

[Arnaud, Siredey, and Garnier (Bull. Méd., '95) relate a case of paroxysmal hæmoglobinuria in a woman 37 years old. F. LEVISON.]

The attacks, which have already been described, vary much in frequency, are usually traceable to exposure to cold, especially of hands or feet. The disease is characterized by intermittent dissolution of the red corpuscles of the blood during the attack. Ehrlich proved this by placing a ligature around the finger of a patient and exposing it to cold; in healthy persons this procedure does not alter the composition of blood, but in patients suffering from paroxysmal hæmoglobinuria the blood drawn from a finger treated in this way will be disintegrated, the blood-corpuscles will be broken up, and the hæmoglobin dissolved in the serum, which therefore has a pink instead of a yellowish color.

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Case of paroxysmal hæmoglobinuria which was apparently caused by sudden exposure to cold water in bathing, and which subsequent examination showed to be due to cold, as the blood of a ligated finger which had been exposed to freezing was greatly disintegrated and not unlike that found in the urine. Sweet (New Zealand Med. Jour., Oct., '96).

During the attacks the number of the red corpuscles is diminished; after the attack many small red corpuscles and hæmatoblasts appear in the blood.

Literature of '96-'97-'98.

Hæmoglobinuria is rarely pure; it is generally accompanied by a real destruction of red blood-corpuscles at the moment of the attack.

2. The loss of hæmoglobin greatly surpasses the loss of red corpuscles, as in one case the loss of hæmoglobin equaled one-third of the normal, while the loss of red corpuscles only equaled one-ninth of the normal.

3. The resistance of the blood is much diminished at the time of the attack. It is found that the red corpuscles destroyed at the end of twenty-four hours during the attack are equivalent to one-third of the total count, while during the normal state not one-quarter of the normal count are destroyed.

4. The so-called paroxysmal hæmoglobinuria being only a symptom, and not a morbid entity, it is important to examine in every case the modifications in the blood in order to find out if different varieties of hæmoglobinuria are associated with different changes in the blood. Vaquez and Marceno (Archives de Méd. Exper., Jan., '96).

Probably the paroxysms are in some cases caused by the presence of parasites in the blood; in animals (oxen, horses) a similar disease has been observed. Kroghs and von Hellens found in the blood of diseased oxen parasitic corpuscles analogous to the plasmodium of malaria.

Systemic origin of the paroxysmal variety of hæmoglobinuria insisted upon. Lépine (La Semaine Méd., Feb. 24, '88).

While admitting a class of hæmoglobinurias of toxic nature due to systemic blood solution, the paroxysmal hæmoglobinurias *a frigore* regarded as invariably of renal origin. Hayem (La Semaine Méd., Feb. 24, '88).

Case of Raynaud's disease with paroxysmal hæmoglobinuria seen in a child of 6 years. In this case both symptoms probably depended upon excess of uric acid in the blood. Haig (Trans. Med. Soc. of London, '92).

Various authors have observed intermittent hæmoglobinuria in connection with syphilis.

Post-mortem upon an artisan with a syphilitic history, subject to paroxysmal hæmoglobinuria, first brought on after a severe chilling three years before. The kidneys were found in a healthy condition except for some amount of hæmic pigmentation of the tubular epithelial cells, and a coagulation-necrosis of a number of the renal cells, causing the appearance of vacuolization. Germino (Med. Press and Circular, Aug. 29, '88).

Typical case of paroxysmal hæmoglobinuria which occurred in a man who acknowledged the three taints of malarial fever, syphilis, and alcoholism. For eight years, every winter, upon the least chilling, occurred paroxysms of hæmoglobinuria. The paroxysms began with chilly sensations, followed by fever and sweat. Brunelle (Le Bull. Méd., June 10, '91).

Four cases of paroxysmal hæmoglobinuria *a frigore* in children. Three of them were caused by heredity syphilis. Comby (Revue Internat. de Méd. et de Chir., July 10, '95).

[Curtis-Suffit (Méd. Moderne, '95) observed a case in a child of 5 years who showed indubitable signs of inherited syphilis. Parry (Jour. of Railway-surgeons, Fort Wayne, '94) and Gubarew (Petersburg. med. Woch., '94) also mention cases of intermittent hæmoglobinuria in syphilitic patients. F. LEVISON.]

Prognosis.—In the hæmoglobinuria caused by poisons, infectious diseases, septic diseases, etc., the prognosis is determined by the gravity of the primary disease; the intermittent hæmoglobinuria is for a long time compatible with life; the patients never die during an attack; recovery has been observed, but often the disease continues for many years.

Prognosis regarded as grave in hæmoglobinuria. Potain (Internat. Med. Mag., Nov., '93).

Treatment.—When hæmoglobinuria is a symptom the treatment must be directed toward the fundamental disease; in cases connected with syphilis an anti-syphilitic treatment has been of use, as well as quinine in hæmoglobinuria of malarial origin.

In malarial hæmoglobinuria use of atropine and strychnine commended as a basis of treatment. The remainder of the treatment is symptomatic. Stamps (Jour. of Med. and Dosimetric Therap., Dec., '88).

In malarial hæmoglobinuria in the early and free use of quinine depends the safety of the patient. As a first dose,

if the temperature be above 103° F., 20 grains recommended, continuing its exhibition in 10-grain doses every three hours afterward for twenty-four hours, then dropping to 5 grains every three hours. If quinine blindness follow, the drug is to be stopped. With each of the first two doses are combined 2 grains of calomel, followed, in ten hours after the last dose of calomel, by a Sedlitz powder.

To allay the vomiting bismuth and opium are used. Chambles (*Med. Bull.*, May, '91).

Case of so-called essential hæmoglobinuria, in a man of 35 years, cured by injections of mercury. Koster (*Therap. Monat.*, Feb., '93).

In every instance of hæmoglobinuria, so-called essential, occurring in a child, the specific treatment should be employed even in the absence of any sign of hereditary syphilis. Courtois-Suffit (*La Méd. Moderne*, Mar. 2, '95).

In paroxysmal hæmoglobinuria change of climate, dietetic treatment, iron, quinine, and arsenic have been recommended.

F. LEVISON,

Copenhagen.

HÆMOPHILIA. — Gr., *αἷμα*, blood, and *φιλεῖν*, to love.

Definition.—Hæmophilia is an inherited or acquired disorder of the vascular system characterized by an abnormal liability to severe and sometimes uncontrollable hæmorrhages.

Symptoms.—The condition is generally discovered by accident, a slight wound, the extraction of a tooth, the application of a leech, vaccination, etc., being followed by profuse and sometimes dangerous bleeding. Epistaxis is of frequent occurrence. In women this is especially the case, because the hæmophilic process mainly manifests itself through the mucous membranes, and menorrhagia, metrorrhagia, post-partum

hæmorrhage, etc., are often suffered from.

Pregnancy and labor do not present the danger for an hæmophilic woman that might be supposed. Of 130 cases, the death of the mother occurred only in 3 and abortion in only 16 cases. R. Kolster (*Wratseh*, No. 28, '95).

Literature of '96-'97-'98.

Case of a girl, aged 11 months, in whom from the third week of life there had been continuous and spontaneous hæmorrhages from the nose, mouth, and rectum, and into the substance of the skin, without, however, impairing in any manifest way the child's development. There was a history on the father's side of hæmophilia, but not on the maternal side. The patient was the only living one of their children; there had been two other girls who had died in infancy, but had not shown any signs of hæmophilia. Comby (*Bull. et Mem. de la Soc. Méd. des Hôp.*, June 25, '97).

Patients subject to hæmophilia constantly exhibit mental peculiarities of definite form. The most important and the most common mental peculiarity is an inability (it is more than unwillingness) to tell the truth about their condition, even when they have had repeated and alarming experience of their defect. Frequently they will persist in obstinate denial of their liability to bleed, even when the hæmorrhage is going on, and resisting all efforts to check it. C. T. Dent (*Brit. Med. Jour.*, Apr. 23, '98).

In men arthritic symptoms are frequently observed, especially during cold and damp weather, the knees being most prone to pseudorheumatic manifestations which are sometimes accompanied by fever. The joint-symptoms are often the precursor of an approaching hæmorrhage.

Hæmophilia does not always manifest itself by external hæmorrhage. The arthritic complications of hæmophilia are generally the result of hæmorrhage into the joint-cavities, but there is no

antagonism between hæmophilia and articular rheumatism. Frederick S. Eve (*Lancet*, Nov. 16, '89).

Three stages described of joint-troubles in hæmophilia: (1) the stage of hæmarthrosis; (2) stage of inflammation; (3) stage of retrogressive changes with deformity. The painless, sudden onset in pale young men marks the first stage. Hæmorrhages in the skin would complete the diagnosis. The second stage is strikingly similar to the white swelling of tuberculous arthritis. The author has three times made a mistaken diagnosis, two of the three cases having suffered death in consequence, from hæmorrhage after operation; the third recovered. Koenig (*L'Encéphale*, June 25, '92).

Etiology.—According to Henry, hæmophilia is the most hereditary of all diseases. Although a fixed law, such as Nasse's—namely, that transmission of the disease through females that are themselves not hæmophilic—cannot be accepted as universal, 30 per cent. of the cases studied by Kolster, for instance, were found to be governed by this peculiar form of heredity.

It is generally possible to demonstrate the hereditary character of this affection, which is the most hereditary of all disease. E. P. Henry (*Boston Med. and Surg. Jour.*, Mar. 14, '95).

The most remarkable family of bleeders of which we have any account is the one living in Tenna, Switzerland. It springs from a couple of the same name, presumably relatives, who lived nearly three hundred years ago, and during this period there have been bleeders among the male descendants. The females, as a rule, remain exempt, the disease being transmitted through them to their male children. Anton Hoessli (*Zeit. f. klin. Med.*, B. 15, H. 3, '88).

Case in a 12-year-old boy whose five brothers and sisters had died of hæmophilia. Fürth (*Inter. klin. Rund.*, Sept. 16, '88).

Case of retinal hæmorrhage seen in a patient giving a family history of hæmophilia for four generations. The right eye, blind for eight years, showed the

remains of an old hæmorrhage into the vitreous. In the left eye there was a small, recent hæmorrhage of the retina, with apparently miliary aneurisms on the retinal artery. Recovery of sight in the left eye was attained by absolute rest, milk diet, and the administration of iodide of potassium internally. Violet (*Recueil d'Ophthal.*, June, '95).

Among other etiological factors considered are a lack of fibrin or fibrinogenous elements and neurasthenia bearing mainly upon the vasomotor constrictors.

Case of a young woman who suffered from epistaxis, menorrhagia, metrorrhagia, hæmorrhagic diarrhoea, etc., always accompanied by great mental strain, fits of crying, fright, anger, and the like; at times, death seemed imminent. Anderson (*Med. and Surg. Rep.*, Mar. 28, '91).

Case of a girl of 16 years, in good health and with no marked history of hysteria, who began to bleed from the pulp of her fingers. This occurred without provocation and without rupture of the skin, and was not attended by any further symptoms, excepting despondency, almost amounting to melancholia. Yahoubian (*Gaz. Méd. d'Orient.*, Mar. 15, '91).

Pathology.—The prevailing view is that hæmophilia is mainly due to a morbid condition of the vascular walls, and affecting especially the middle or muscular layer. According to Kuhlmann, the changes are such as to seriously compromise the anatomical and physiological functions. These changes are: Granulation-neerosis occurring in tuberculosis, syphilis, leprosy, etc., and due to direct chemical changes between the physiological products of certain organisms and the protoplasm of the histological elements; amylosis occurring during extensive suppuration processes, and due to a similar direct change; coagulation-neerosis or mucoid degeneration occurring in cancerous and diphtheritic proc-

esses; liquefaction - necrosis occurring in typhus, variola, etc.; fatty and calcareous degeneration, in which the protoplasm is replaced by fatty granules and crystals of carbonate and phosphate of lime. The vasomotor system doubtless plays a part in the process.

It is possible that abnormal alkalinity of the blood may, by impairing the capacity of the blood for coagulation, assist in the production of hæmorrhages.

In a case of repeated and excessive epistaxis in a man of 49 years lime-water in liberal quantity caused the hæmorrhage to cease and remain absent until the patient neglected the use of the remedy. Watkins (*N. Y. Med. Jour.*, Aug. 13, '92).

All the hæmorrhagic diseases are but alterations of one form, viz., scurvy. W. Koch (*Jahrb. fur. Kinderh. phys. Erziehung*, B. 32, H. 1, 2, '91).

Essence of hæmophilia believed to lie in a heightened activity of the blood-making organs, the hæmorrhages into the joints and elsewhere being regarded as discharges, or eliminations of superfluous blood. M. Cohn (*Centralb. für klin. Med.*, Oct. 12, '89).

Syphilis may manifest itself in an hæmorrhagic diathesis. Gregorio Cosella (*Archivii Ital. di Clin. Med.*, July, '89).

Prognosis.—Hæmophilia is particularly to be feared when it occurs in children in an aggravated form. In slight cases the disease frequently disappears at puberty. The hæmorrhages are usually more dangerous in boys than in girls; uterine hæmorrhages, though copious, seldom endanger life.

Case in which the family history showed no hæmophilia on either the father's or mother's side as far back as the fourth generation. Of their five children, however, the second at 3½ years developed hydrocephalus and suffered from frequent severe and uncontrollable hæmorrhages from the nose, of which he finally died. The third child showed no evidence of hæmophilia, but died of malignant scarlet fever at 2

years of age. The fourth child had severe hæmorrhage when he began cutting teeth, and at the eruption of the molars he bled to death. Judson Daland (*Boston Med. and Surg. Jour.*, Mar. 14, '95).

Treatment.—The treatment of hæmophilia mainly consists in the avoidance of exciting factors. The extraction of teeth should especially be guarded against and preference be given to measures, such as gradual loosening and evulsion with rubber, of a tooth, rather than to the forceps. Scratches, cuts, etc., should be avoided; hence an occupation exposing the sufferer to solutions of continuity becomes dangerous. Violent exercise is occasionally the only exciting factor.

Fatal case of hæmophilia, following extraction of a tooth, in a young man. Bates (*Annals of Surg.*, May, '94).

Prophylactic treatment between attacks is also indicated. Of all the preparations, *hydrastis Canadensis* has proved most successful, when administered in large doses, 10 to 15 drops of the fluid extract, three times a day.

Large doses of fluid extract of *hydrastis* (20 drops) advised in hæmophilia. Delafield (*Med. Age*, Apr. 11, '92).

The various preparations of iron have been recommended; ferratin is probably the most useful preparation at our disposal. The perchloride has been recommended by Legge. Strychnine is indicated on account of the involvement of the vasomotor system. Saline purgatives, by reducing the arterial tension, are valuable when prodromic symptoms are noticed.

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Case of a woman who, because of hæmophilia, suffered from very excessive anæmia. She was treated by the various hæmostatics, and by repeated injections of ergotine, without much result. Finally

3 capsules of thyroid gland were given each day, with the result that the loss of blood was immediately arrested. The patient gained in weight, the purpuric spots disappeared, the gums became firm, and some color began to appear in the face. Cardiac palpitation was decreased. At no time was the dose greater than 3 capsules a day. *Dclace* (*Jour. de Méd. de Paris*, Jan. 23, '98).

In the treatment of hæmophilic hæmorrhage the recumbent position (except when the bleeding is at the nose) is of primary importance to reduce cardiac action. In women an alum plug inserted in the vagina, as recommended by Beverly Cole, is an efficient means. Lime-juice internally and hypodermic injections of ergot should supplement the use of local styptics, the best of which are turpentine and perchloride of iron when these can be used. When the hæmorrhage is from the nasal cavities, the various measures recommended under EPISTAXIS are recommended. Transfusion sometimes becomes necessary, but it should be conducted with unusual care, owing to the morbid condition of the vascular walls.

The best hæmostatic is the transfusion of entire blood, of which but a small quantity will sometimes stop an otherwise uncontrollable hæmorrhage. Hayem (*Le Bull. Méd.*, Sept. 16, '88).

HÆMORRHOIDS.—Gr., from *αἷμα*, blood, and *ὁρροίς*, pertaining to.

Definition.—A vascular tumor of the mucous membrane of the rectum, the anus, or both.

Varieties.—Hæmorrhoids may be classified into two varieties: external and internal.

They are called *external* when the skin alone is involved, and the tumor is external to the external sphincter muscle, while the internal are covered by the mucous membrane. It often happens,

in long-standing cases, that internal piles protrude outside the anus, yet, when they are returned into the bowel, they will remain for a short time, at least; but the external cannot be pushed up into the bowel. Should only a portion be returned while the other remained on the outside, it might properly be termed a *combination pile*.

Symptoms and Diagnosis.—There is usually a sense of fullness and heat, throbbing pain, tight sphincter, with irresistible tendency to strain, and sometimes an itching sensation. When inflammation is present to any degree, the patient will be uncomfortable in any position he may assume, and may also have a slight elevation of temperature.

The following are the diseases which resemble hæmorrhoids most: 1. Polypi. 2. Villous tumors. 3. Malignant growths. 4. Prolapsus. 5. Pruritus ani. 6. Hæmorrhages.

Polypi can be differentiated from hæmorrhoids by their soft, smooth, elastic feel, pyriform shape, and long, slender pedicle.

Villous tumors by their broad base, slow growth, spongy feel, dark-red color, and frequent hæmorrhages.

Malignant growths in the early stage present a number of hard nodules on the side of the rectal wall; at a later date they become larger and break down, after which the diagnosis is made without difficulty.

Prolapsus involves the entire circumference of the bowel. The tumor is cone-shaped, with a slit in the centre, and has a velvet-like appearance, while piles are distinct tumors.

Pruritus ani is frequently called itching piles. This is not warranted, since there is an absence of both tumors and hæmorrhage, while the itching is caused, in a large percentage of cases, from some

irritating discharge from the rectum, thread-worms, neuroses, or eczema of the skin. Hæmorrhages of all kinds from the rectum are usually attributed to piles, but may be due to ulceration, injury, fissure, and malignant growths.

Etiology.—Neither sex nor station in life is a bar against the production of hæmorrhoids. The erect position man occupies is, from gravity alone, conducive to them. The rectum is abundantly supplied with veins, which enter into the formation of the hæmorrhoidal plexus. A portion of this blood is returned through the internal iliac to the inferior cava, the remainder by way of the inferior mesenteric to the liver; and these veins, like others of the portal system, have no valves. The branches of the superior hæmorrhoidal veins in their journey upward pass through little slits in the muscular wall, and therein, Verneuil claims, is to be found the principal cause of this disease. He believes that the dilatation is due to the obstruction of the calibre of the veins from the muscle's contracting on them as they pass through it. While this anatomical fact undoubtedly tends to dilatation under certain conditions, it does not seem to be sufficient of itself to account for the enlargement of the veins in all cases. It is well known that the rectal and anal plexuses have no valves, and, further, that, when a patient afflicted with prolapsed piles is requested to strain down, they at once become engorged with venous blood as a direct result of the pressure of the abdominal muscles. It is not at all unreasonable, then, to suppose that the pressure from the above muscles on the blood-column or the pressure from a pregnant uterus of some growth might be productive of hæmorrhoids by interfering with venous circulation. Some of the common causes of this disease are

morbid growths of liver, spleen, uterus, ovaries, and prostate by causing venous obstruction.

Hæmorrhoids and painful fissure are often associated with uterine disease, either inflammatory in nature or due to the pressure of tumors. Murray (*Archives of Gynec.*, June, '91).

Constipation, stone in the bladder, urethral obstruction, and purgatives are also conducive to piles from the intense straining which they induce. Congestion of the liver, obstructive diseases of the heart, improper diet, alcoholism, and irregular habits, as well as inherited predisposition, may all be said to be etiological factors.

Many railway-employees suffer from hæmorrhoids as a result of irregularities in living, combined with the jarring motion of the train.

The causes of hæmorrhoids are: 1. Diminution of the forces that normally move the venous blood from the rectum to the heart. 2. Obstruction of the venous outflow from the rectum. 3. Predisposition.

From these views of the etiology of hæmorrhoids may be easily deduced the principles of prophylaxis. Wallace A. Briggs (*Occidental Med. Times*, Dec., '95).

The cutaneous variety of external pile is classified as redundant, hyperplastic, or hypertrophic. The distinctive feature of the redundant pile is the superabundance of the anal integument brought about by the stretching it receives from the subadjacent varicose external hæmorrhoidal veins when they are fully distended, as during defecation. The hyperplastic pile appears in the form of a pendulous cutaneous tag, associated with an abrasion, fissure, or ulceration of the anal verge, and is the result of an inflammatory hyperplasia; while the term hypertrophic indicates that the swelled, thickened, radiating anal folds associated with the eczematous inflammation are the result of an inflammatory

or irritative hypertrophy. J. Walter Otis (Amer. Jour. Med. Sci., Feb., '95).

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Hæmorrhoids consist essentially in the new formation of young blood-vessels by a process of germination from the older vessel-walls and the consequent formation of a cavernous tissue. Inflammatory changes, such as thrombosis and endophlebitis, may also occur within the neoplasm, but are absent in the majority of cases. Venous stasis has nothing to do with hæmorrhoids, being at most a secondary phenomenon. George Reinbach (Beiträge zur klin. Chirurgie, vol. xix, No. 1, '97).

External Hæmorrhoids.

External piles are so common that few persons arrive at middle age without having suffered from them. They are classified into thrombotic and cutaneous varieties.

Thrombotic or venous piles consist of elevations of skin near the anal margin, oval in form and of a livid color or slightly tinged with blue, filled with a hard clot of blood inclosed in a sac. The amount of pain depends upon the inflammation. Usually it becomes severe and will continue until the clot is turned out or suppuration takes place. These tumors form quickly, and present themselves during the act of defecation, following an attack of constipation, necessitating great straining. They have the appearance and feeling similar to that of a bullet beneath the skin, and are generally single. They are caused by excessive eating, irregular habits, and anything that is conducive to constipation.

Unless external hæmorrhoids become irritated or inflamed they will cause little inconvenience; in fact, many persons go through life with them and suffer very little. When the parts are not properly attended, they frequently become acutely

inflamed and cause much pain and annoyance until they are removed.

Treatment of External Hæmorrhoids.

—The treatment of external piles may be *palliative* or *operative*. The latter is always to be preferred unless the patient refuses to submit to a trivial operation. In such a case much relief is to be had from the use of certain palliative measures.

PALLIATIVE TREATMENT.—In all cases attention should be paid to the diet. The use of highly-seasoned food and stimulants, such as tobacco, whisky, wines, and beer, should be discontinued, and a simple diet substituted. The bowels should be kept open by the use of Vichy, Hunyadi, Freidrichshall, or some other mineral water. If there are symptoms of a congested liver, a few calomel parvules, $\frac{1}{10}$ grain, or the blue pill properly administered will prove beneficial. Frequent hot baths should be taken, and the anus washed with Castile soap and water. If the pile belong to the first variety, containing a hard clot, frequent applications of an ointment composed of

℞ Morphine sulphate, 6 grains.

Calomel, 12 grains.

Vaselin, 1 ounce.

will soothe the parts and reduce the inflammation. The old-time lead-and-opium wash, either hot or cold, applied constantly, affords great relief:—

℞ Lead-water, 4 drachms.

Tincture of opium, 2 $\frac{1}{2}$ drachms.

Distilled water, enough to make 4 ounces.—M.

The lead solution mixed with the sugar of milk forms a very soothing application. Hot poultices of any kind, if applied constantly, will prove valuable in relieving pain and reducing inflammation in either variety.

In the medical treatment of hæmorrhoids daily action of the bowels should be obtained. Sponging the anus and surrounding parts with soap and cold water is a very efficient application. Less meat and more vegetable food is to be eaten and physical exercise taken daily. Injections beginning with lukewarm water and gradually changing to cold often afford great relief. Those who suffer from hæmorrhoids should, if possible, give up taking stimulants entirely. Thomas (Lancet, Jan. 31, '91).

Tar warmly recommended in the treatment of hæmorrhoids. The following ointment may be used:—

R Tar,

Extract of belladonna, of each. 46 minims.

Glycerin, 1 fluidounce.

M. Sig.: To be applied locally morning and evening. Lacruz (Revista de Med. y Cirujica Practicas, Apr. 7, '94).

The pain and irritation accompanying inflamed hæmorrhoids may be quickly relieved by local washing with a weak solution of bichloride,—about 6 ounces of a 1 to 10,000 solution. Immediately after this the patient should introduce a tampon of cotton impregnated with the following ointment:—

R Lanolin, 1½ ounces.

Vaselin, 5 drachms.

Distilled water, 1 fluidounce.

M. Sig.: For external use.

These applications should be made a number of times each day. Illinsky (Revue Internat. de Méd. et de Chir., Dec., '94).

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External piles and anal pruritis treated by the application of collodion. This causes the pile to contract and supports the contracted pile. The collodion is applied on a little cotton-wool each morning after defecation. D. W. S. Samways (Brit. Med. Jour., Nov. 21, '96).

Following ointment employed in the treatment of hæmorrhoids: 2 ounces of camphor-lanolin; 3 drachms of castor-oil; 1½ drachms of precipitated chalk; 30 grains of hydrobromate of cicutin. Monin (Méd. Mod., Nov. 4, '96).

OPERATIVE TREATMENT.—In the thrombotic variety the tumors should each be incised, the clot turned out, and some escharotic or packing applied to the inside of the pile to insure the closing of any rent in the vein. The patient should then be placed in bed to remain there for several hours to prevent the tumors' filling up again.

The surgical treatment of the cutaneous variety differs somewhat from the one just referred to, in that the tumor is seized with a pair of catch-tooth forceps and then snipped off with a pair of curved scissors, care being exercised not to remove any more of the skin than is absolutely necessary, lest too much contraction follow the operation. When there is considerable space between the edge of the skin and the mucous membrane, it is best to unite them by catgut sutures. If the sphincter has been previously divulsed, little pain will follow the operation. When there is only one tumor and that small, it can be removed with comparatively little pain after an injection into it of a 6-per-cent. solution of cocaine. It does not make any difference, from an operative point of view, whether the pile is inflamed or not; it should be operated upon just as soon as the patient's consent is obtained.

Cases of stricture from operations for extreme hæmorrhoids have been reported, but they are rare and follow only where an *excessive* raw surface is left after removal of swelled tumors.

Cutaneous Hæmorrhoid, or Hypertrophied Skin.—This variety consists of hypertrophied prolongations of the skin. Cutaneous piles are frequently a result of the other variety, a fold of skin being left after the clot has been out-turned or absorbed. They may be single or multiple, but usually retain the natural color of the skin, which has become thickened.

They are much aggravated by improper diet, irregular habits, and uncleanness.

Internal Hæmorrhoids.

Internal hæmorrhoids are developed, in many respects, like the external variety, and the causes which produce the one may also produce the other. In cases of long standing they remain outside the anus nearly all the time and frequently become ulcerated, causing much pain and bleeding. It is not uncommon to see both external and internal piles present at the same time, thus necessitating a combination operation to insure a good result. The internal variety is due to certain changes which take place in the blood-vessels in and beneath the mucous membrane.

Symptoms.—Some patients have internal piles for years and suffer very little annoyance from them, while others suffer greatly from the first. Frequently strong men and women become emaciated and nervous from an apparently simple case,—so much so that they are totally unable to attend to their ordinary duties. The most prominent symptom of this variety of piles is the bleeding, and from this fact they are frequently referred to as “bleeding-piles.” The bleeding is usually preceded by the protrusion of the tumors during the act of defecation, and may be slight or profuse. Sometimes the hæmorrhages are sufficient to induce fainting. When the piles are not inflamed, the only inconvenience is a sensation of heat and fullness; but when they become swelled or strangulated and the inflammation becomes active, the sphincter alternately contracts and relaxes on them, thus producing most excruciating pain, which lasts until they slough off, have been operated on, or are relieved by palliative remedies. In cases of long-standing, the walls of the piles become tough and

hypertrophied. The bleeding, in the vast majority of cases, is of a venous character.

Cripps believes that the spurting, in cases which appear to be arterial, is due to the blood's being forced as a regurgitant stream through a rupture in the vein by the powerful abdominal muscles. In some instances, however, others have witnessed hæmorrhages wherein the blood presented the appearance of that coming from an arterial twig.

Internal hæmorrhoids may be divided into two classes, viz.: capillary and venous.

CAPILLARY.—The capillary tumors are rare, smaller than the venous, spongy in texture, are formed by the *superficial vessels* of the mucous membrane, and resemble strawberries. They may appear alone or be present with the venous variety. They rarely protrude and scarcely ever give pain, but always bleed profusely.

VENOUS.—This variety is of more frequent occurrence than the capillary; the tumors are large and vary in size from one-half to one inch across their bases, are covered by mucous membrane, having a glistening appearance, are a bluish or livid color, and are formed as a result of a dilatation of the veins in the mucous and submucous tissues.

Treatment of Internal Hæmorrhoids.

—**PALLIATIVE.**—Palliative measures afford relief in many cases, while in a few they may reduce the piles altogether. When these are small and cause but little suffering, the treatment is simple. In the first place, errors in diet and habits of living should be corrected. When piles are protruded and inflamed the patient should assume the recumbent position and keep perfectly quiet, and soothing or astringent lotions and ointments should be applied constantly

When these fail relief can often be had from ice and poultices made of flaxseed, corn-meal, and onions. The symptoms of a congested liver should at once be counteracted.

When piles are not large or strangulated they can be made to contract by the application of pure nitric acid. The tumors must be returned above the sphincter at the earliest opportunity. If the patient must work he may get some comfort from a pile-supporter. The bowels should be kept open at all times and the patient instructed to cultivate regular habits as to the time his bowels should be moved.

In hæmorrhoids large injections of cold water at 40° to 50° F., either plain or containing boric acid or antipyrine, are productive of much good in the abatement of inflammation, congestion, and in arresting small bleedings. J. E. Davis (N. Y. Med. Jour., June 15, '95).

For internal hæmorrhoids excellent results obtained from tincture ferri perchloridi and hazelin, 20 drops of each in an ounce of water internally, twice daily, and injections *per anum* of tincture ferri perchloridi, 4 drachms, and hazelin, 4 drachms. The injection is best given at bed-time, so that it may be retained. N. C. Mitra (New Orleans Med. and Surg. Jour., Nov., '95).

SURGICAL TREATMENT.—Operations when properly performed always effect a permanent cure, and in a shorter time than is required for even temporary relief by palliative measures; the suffering is much less when there are no complications. The operation is a trivial one, insuring complete cure; it should be recommended, and performed at once, regardless of any inflammation.

When an operation is necessary, that best suited for the case under advisement should be selected, no single operation being adaptable to all cases.

The general health of the patient

should be looked into, and improved, if need be, by appropriate measures. The urine should be carefully examined to detect the presence of any kidney complication. On the morning preceding the operation 2 teaspoonfuls of compound licorice-powder should be given, and one hour previous to the same the surrounding parts should be cleansed, shaved, if necessary; and the rectum thoroughly washed out.

OPERATIONS.—Many operations, more or less valuable, have been devised for the relief of hæmorrhoids. Dilatation of the sphincter has met with some success by French surgeons, who originated it.

Dilatation of the anus. In the first stage of hæmorrhoids—that of intermittence, where the attacks occur but three or four times a year and are accompanied by a slight burning sensation and pruritis of the anus, with a small flow of blood—gentle purgatives are ordered, applications of very warm water, enemata at the same temperature, and applications of plugs of cotton steeped in a 1-per-cent. solution of cocaine. In the second stage, where the piles are procident and the rectal varicose veins are very painful, forcible dilatation gives unvarying success. Before employing the speculum, local anesthesia of the parts is produced in the following manner: The patient being placed in the classical position on the side, with one leg extended, the other bent on the thigh and on the abdomen, an assistant exposes the anal region. The operator takes in a forceps a small plug of cotton, steeped in a 1-per-cent. solution of cocaine, and passes it into the rectum as high up as possible; this plug is followed by another a little larger, and yet a third and a fourth, increasing in size until he can insert one as large as a walnut. He then takes an ordinary Pravaz syringe filled with the same solution and inserts the needle into the perineum, half an inch from the anus, and injects slowly the contents, taking care to turn the needle in different directions, and by this means one-

fourth of the circle limiting the rectal orifice is anæsthetized. The injection is renewed in the second quarter, and so on until the circle is completed, each syringe containing $\frac{1}{4}$ grain; it is thus that 1 grain of cocaine has been injected. But in order that the dilating process should be painless the sphincter must be anæsthetized, and for this purpose the operator passes the index finger of the left hand into the rectum and plunges the needle through the skin up to the muscle, guiding it with the finger; he empties half of the syringe at that point and the remainder as he is withdrawing it.

Twenty-six patients operated upon in this way without any accident. In the third stage, where the veins form a tumescient mass, they should be removed with the bistoury, without dissection of the mucous membrane. Paul Réclus (La Semaine Méd., Nov. 28, '94).

Experience has shown, however, that dilatation offers only temporary relief. The crushing method of Mr. Herbert Allingham is occasionally used in England, but rarely in this country.

And it may be said that of all the operations proposed, but four operations are entitled to consideration. They are: the injection, Whitehead's, ligature, and clamp and cautery.

Injection.—A few years ago the treatment of piles by this method was quite in vogue, but specialists have practically discarded it. Experience has shown that the results are not permanent and that annoying complications frequently arise. This method is attractive to the laity because no knife is used; it is sometimes painless, and does not detain them from their business. This is true when a perfect result is obtained. On the other hand, when extensive inflammation and sloughing occurs they will suffer more pain and be detained longer than if a better and more radical operation had been made. It certainly is not the best operation for the average case of piles

and is suited only for the *small, distinct, pendulous* piles situated above the grasp of the sphincter-muscle that bleed freely.

Piles should not be injected when inflamed, strangulated, large and hypertrophied, or external. When they are injected promiscuously the treatment will frequently be followed by great pain, swelling, sloughing, abscess, fistula, phlebitis, pyæmia, long delay from business, partial cure, and occasionally death. When used in selected cases, however, a cure is obtained quickly with little pain. The preparations are the same as for any other rectal operation. It is well to warn patients when they have several tumors that two or three treatments may be necessary to effect a complete cure. An ordinary hypodermic syringe and a small speculum are the only instruments required. To avoid accidents it is well to observe the following rules:—

1. Cleanse the anus and surrounding parts.
2. Place the syringe and needle in boiling water until everything is in readiness.
3. Accurately gauge the amount to be injected.
4. Force the air out before introducing the needle.
5. Inject the fluid slowly in the *pendulous* portion.
6. Inject from 2 to 5 drops in small and 5 to 10 in large piles.
7. Leave the needle within until the pile turns white.
8. Do not inject the tissue beneath the pile.
9. As the needle is withdrawn make pressure with the index finger to prevent the escape of the fluid and arrest hæmorrhage.
10. Promptly return all tumors.
11. Make a fresh solution for each injection.

12. Keep the patient in the recumbent position one-half hour after the operation.

13. Only a fluid or semisolid diet should be permitted for a few days.

14. Weak in preference to strong solution should be employed.

15. Inject only one or two piles at a sitting.

As to the solutions to be injected, almost all the caustics in the vegetable and mineral kingdoms have been tried, with varying success. The most successful results have been obtained, however, from carbolic acid in combination with glycerin, alcohol, olive-oil, and water. Experience has shown that the weaker solutions cause fewer complications and give better results than the stronger. The following formula is very satisfactory:—

℞ Carbolic acid, 12 grains.
Glycerin, 1 drachm.
Water, 1 drachm.—M.

Iodine, iron, ergot, and ergotine have been extensively used, but have no advantages over carbolic acid.

Injections of iodoform tried in twelve cases of hæmorrhoids with excellent results. After having prepared the patient by cleansing the bowels thoroughly with repeated irrigations of a solution of salicylic acid about fifteen minutes before the operation, a suppository containing 2 grains of cocaine and from $\frac{1}{4}$ to $\frac{1}{8}$ grain of morphine is introduced into the rectum. If the patient is extremely sensitive at the beginning of the operation a 1-per-cent. solution of cocaine should be injected into different portions of the mucous membrane.

After the introduction of an iodoform-gauze tampon through a small speculum the tumors are brought into view without grasping them with a forceps. Two drops of a saturated solution of iodoform in ether are then injected into the cellular tissue adjoining each nodule. In place of the gauze tampon a supposi-

tory containing 2 grains of salicylic acid is now substituted, and bismuth and opium are given to prevent a movement of the bowels. On the third day 2 ounces of olive-oil are injected into the rectum, and castor-oil is given *per os*. This operation does not prevent the patient from attending to his daily work. Beck (N. Y. Med. Jour., July 21, '94).

An excellent method of treating hæmorrhoids consists in dilatation of the anus, followed by injections of 2 drops of a solution of glycerin and carbolic acid—50 to 80 per cent.—into each of the tumors.

A piece of iodoform gauze coated with vaselin and boric acid is placed *in situ* and maintained by a T-bandage. The next day the hæmorrhoids are found to be hard, but not painful, and in a few days they contract and disappear. Rest of one or two days in bed completes the treatment. G. Roux (Ther. Monat., Mar., '95).

An ordinary case of hæmorrhoids can be cured by injection and the patient still be able to work. It is an error to use oil in any injection. The author uses for a single syringe-ful

℞ Acid carbolic, 2 to 5 drops.
Alcohol (pure), 10 to 20 drops.
Distilled water, enough to make 1 drachm.—M.

Two to 3 minims to be injected alongside each pile as the needle is withdrawn. The syringe and rectum should be clean and not more than three hæmorrhoids injected at once.

One must be careful not to enter the vessel with the needle. If a man is at work, one hæmorrhoid at a time should be treated every four or five days. Carter S. Cole (The Post-graduate, Nov., '95).

Whitehead's Operation.—Mr. Whitehead describes his operation as follows: "By the aid of scissors and a pair of dissecting forceps the mucous membrane is divided at its junction with the skin around the entire circumference of the bowel, every irregularity of the skin being carefully followed. The external

and the internal sphincters are then exposed by rapid dissection and the mucous membrane and the attached hæmorrhoids, thus separated from the submucous bed upon which they rested, are pulled bodily down, any undivided points of resistance being snipped and the hæmorrhoids brought below the margin of the skin." The mucous membrane above the hæmorrhoids is now divided transversely in *successive stages* and the free margin of the severed membrane above is attached, as soon as divided, to the free margin of the skin below by a suitable number of silk sutures, which he does not remove. He prefers the lithotomy position and uses torsion to arrest hæmorrhage in preference to the ligature. Mr. Whitehead claims that piles are not individual tumors, but that they are only a part of the general plexus of the veins associated with the superior hæmorrhoidal, each radicle being similarly, if not equally, affected by the initial cause, either constitutional or mechanical. He believes that all vessels should be exposed, and that the entire pile-bearing area should be removed. The operation has not become general either in this country or in England; in fact, few, if any, perform it either in an ordinary or a severe case.

The operation under consideration certainly deserves a place in rectal surgery, but not so prominent a one as Mr. Whitehead grants it. It is not suited for the treatment of *ordinary* or even *severe* cases, for two reasons: first, they can be cured by a less difficult operation; second, complications frequently accompany and undesirable results may follow the operation. The operation is indicated in long-standing cases, accompanied by frequent hæmorrhages, where there are no distinct pile-tumors, but where the veins of the entire rectal wall

are engorged and extensively dilated from the external sphincter upward for two or three inches. When such a condition is present nothing short of the removal of the entire disease area will effect a cure.

Whitehead's operation is an ideal one in certain cases. It is only indicated, however, where the entire, or nearly the entire, circumference of the pile-bearing portion of the rectum is involved. M. Borts (Cleveland Med. Gaz., Feb., '95).

Literature of '96-'97-'98.

Whitehead's treatment of hæmorrhoids regarded as method of election in cases of large internal or externo-internal piles forming a prominent circular mass. In eighteen cases thus treated by the author the results were very satisfactory. The cure is a radical one, provided the gut be incised above the zone of venous dilatation. Delorme (Méd. Mod., Oct. 31, '96).

It is necessary to emphasize the danger of stricture's following this operation; I have had 15 such cases come under my care within the past five years. Persons thus mutilated not only suffer from the constriction and ulceration, but in addition from an unbearable pruritus that is being irritated constantly by the discharge. All these untoward conditions are the result of non-union and retraction of the mucous membrane.

Opinion of a large number of surgeons, both in this country and Europe, secured in regard to the disastrous results that are apt to follow Whitehead's operation. The replies include 200 cases, of which the following is a summary: Loss of the special sense by which the patient should be warned of a coming evacuation and enabled to prepare for it, 8 cases; incontinence of flatus and feces, 23 cases; paralysis of the sphincter, 4 cases; chronic inflammation of the rectum, 1 case; failure of union of the wound by first intention, with retraction of the edges of the wound, forming a contract-

ing, tubular ulcer with stricture, 9 cases; other ulcers, 2 cases; irritable and painful anus, 12 cases; eversion of the mucous membrane, 4 cases; neuralgia of the pelvis and inferior extremities, 2 cases; general neurasthenia, 1 case; fatal peritonitis, 1 case; non-fatal septic results, 5 cases; *fistula in ano*, 1 case; reported as having bad results without accurate description, 127 cases. Total, 200. Andrews (Columbus Med. Jour., No. 3, '95).

If, in the statistics given by Andrews, the names of the operators were mentioned, most of the disastrous results will be found to have followed the work of incompetent men. The writer's own results have been excellent in those cases in which he had done the Whitehead operation, slightly modified by himself. Marcy (Jour. Amer. Med. Assoc., Sept. 14, '95).

Literature of '96-'97-'98.

Whitehead's operation (complete resection) considered rather formidable, with loss of time, considerable hæmorrhage, and danger of sepsis; Allingham's (ablation and ligation) excellent in most cases, but takes longer, involves a greater loss of blood, and is followed by more post-operative pain than the clamp and cautery. In recommending the latter the necessity of stretching the sphincter, applying the clamp in the long axis of the bowel, and using the cautery at a dull red heat emphasized. Parker Syms (N. Y. Med. Jour., Feb. 12, '98).

Ligature is pre-eminently the best for ordinary cases of piles, with one exception, namely: the clamp and cautery. The results that have followed both have proved that they are deserving of the highest praise and a detailed consideration. The reader may choose the one he can perform with the most satisfactory results, with the assurance that a radical cure will be effected.

Surgeons differ as to the best method of applying the ligature. The majority, however, prefer the operation which was

devised by the late Mr. Salmond and popularized by Allingham, Sr.

The patient, having been previously prepared by purgation, is placed on the right side of a hard couch in a good light and is completely anæsthetized. The sphincter-muscle is then completely, but gently, dilated. This completed, the rectum for three inches is within easy reach, and no contraction of the sphincter takes place; so that all is clear like a map. The hæmorrhoids, one by one, are taken by the surgeon with a vulsellum, catch-tooth, or Pratt's "T" forceps, and drawn down. He then, with a pair of sharp scissors, separates the pile from its connection with the muscular and sub-mucous tissues upon which it rests. The cut is to be made in the sulcus, or white mark, which is seen where the skin meets the mucous membrane, and this incision is to be carried up the bowel and parallel to it to such a distance that the pile is left connected by an isthmus of vessels and mucous membrane only. There is no danger in making this incision, because all the larger vessels come from above, running parallel with the bowel, just *beneath* the mucous membrane, and thus enter the upper part of the pile. A well-waxed, strong, thin, plaited silk ligature (Turner's, No. 8) is now to be placed at the bottom of the deep groove made, and the assistant then draws the pile well out. The ligature is tied high up at the neck (see Fig. 1) of the tumor as tightly as possible. Great care must be exercised in tying the ligature. The operator should be equally careful to tie the second knot so that no slipping or giving way can take place. If it is advisable, tie a third knot, for the secret of the well-being of the patient depends greatly upon this tying,—a part of the operation by no means easy to effect. If this is done, all the large vessels in the

piles must be included. The arteries in the cellular tissues around and outside the lower bowel are few and *small*, and do not assist in the formation of the pile, being outside it. The silk should be so strong that the operator cannot break it by fair pulling. If the pile is very large, a small portion may now be cut off, taking good care to leave sufficient stump beyond the ligature to guard against its slipping. When all the hæmorrhoids are

omy position, with the limbs well flexed on the abdomen and held in position by Clover's crutch, presents a better view of the parts after the sphincter has been divulsed. Sitting upon a high stool in front of the patient, the operator has the free use of his hands and can apply the ligature with more ease and in a shorter time than when the patient is placed on the side. After all of the piles have been ligated and those portions external to the

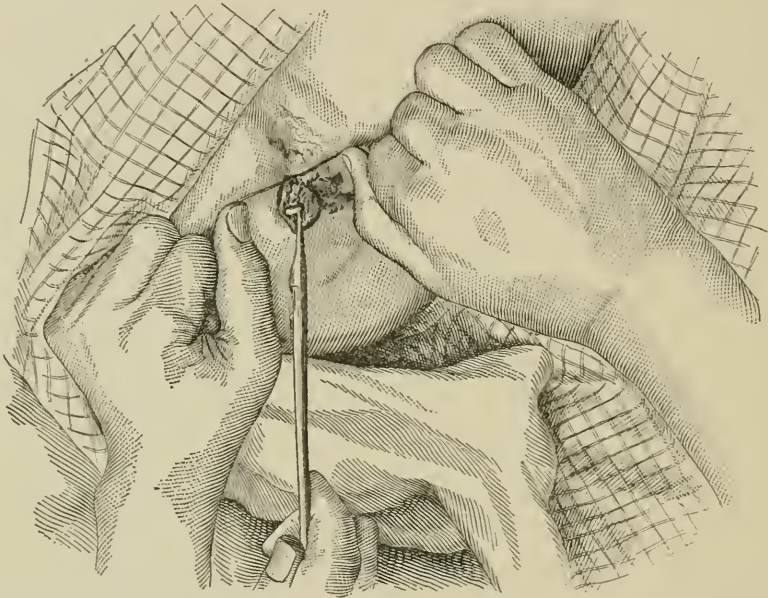


Fig. 1.—Correct method of applying the ligature. (*Gant.*)

thus tied they should be returned within the sphincter. After this is done any superabundant skin which remains apparent may be cut off; but it should not be too freely excised, for fear of contraction when the wound heals. A pad of gauze is then placed over the anus; this is covered with a tight T-bandage, as it relieves pain most materially and prevents any tendency to straining.

To secure a cure by the ligature it is not essential to follow in detail the various steps as just recorded. The lithot-

ligature cut off, the stump should be placed within the bowel.

Patients suffer considerably for the first twenty-four hours because the sensitive nerves have been included in the ligatures. The pain during the second and third days is frequently quite annoying, though in some cases it will be very slight. The lower part of the rectum presents a sensation of heat and fullness. Patients are often awakened after the operation by sudden contractions of the levator ani, and the strangulated stumps

seem to act as foreign bodies, keeping up irritation. The ligatures will ordinarily slough off from the seventh to the ninth day, but now and then they have to be removed by the surgeon. This complication occurs more frequently than the friends of the ligature would have us believe, and in such cases increased pain and delayed healing are always noticeable. The time required to remain indoors in such cases varies from three to six weeks.

As a rule, patients operated on by the ligature are able to be about from ten days to two weeks, although the ulceration may not be entirely healed. Many other operators have met with equally good success. This fact, coupled with the permanent cure which follows this operation, has won for it a very enviable reputation. At the same time there is one other operation—the following—that will be succeeded by just as good results, from which patients suffer much less, recover more quickly, and with as few bad results as follow the ligature, namely: the clamp-and-cautery operation.

Bloodless method for treating hæmorrhoids, each hæmorrhoid being seized close to its base between the tips of the thumb, index, and middle fingers. It is put upon the stretch and twisted and finally so completely crushed that it is pulpified, and none of the investing tunics remain except the mucous membrane and its understratum of fibrous tissue. Thirty-two cases treated successfully by this method. Manley (Boston Med. and Surg. Jour., Feb. 1, '94).

Literature of '96-'97-'98.

Recovery followed all of the 269 cases treated in Dittel's service by Dittel's elastic ligature for hæmorrhoidal nodules.

Twelve days was the average time. No anæsthesia is used except Schleich's local infiltration. The curved polypos-

forceps are guided by a finger of the left hand inserted into the rectum. By turning the forceps ninety degrees the nodule is brought up out of the anus, and with the surrounding mucosa is then ligated with an elastic cord stretched to its utmost. The nodules lose their vitality in eight to ten days and drop off, leaving a clean, granulating surface. The external anal skin must not be included in the ligature. Editorial (Jour. Amer. Med. Assoc., Nov. 6, '97).

The *clamp-and-cautery operation* was originated by Mr. Cusack, of Dublin, and brought prominently before the profession in England by Mr. Henry Smith. In America it is a question which is the more popular, the clamp-and-cautery or the ligature, both having advocates of equal ability. I have previously indicated my preference for the clamp-and-cautery operation. At present there are at our command many admirable clamps, the very popular Paquelin cautery, and the cautery irons. By the aid of these the operation can be performed with rapidity; and, when used with care, it is not a barbarous procedure, as is often claimed, but a scientific surgical operation, whereby only the diseased tissue is removed. The pain which follows the clamp-and-cautery operation is less than that of any other operation for piles.

There are four steps in the operation:

1. The sphincter-muscle should be thoroughly divulsed in every direction (Fig. 2). This will cause the piles to come quite prominently into view. Each in turn is seized with a vulsellum or catch-tooth forceps and drawn well down.
2. The mucous membrane and skin should be severed and the pile dissected upward (Fig. 3).
3. The clamp should be adjusted firmly in the incision at the base of the tumor; that portion external to the clamp is then excised with a pair of scissors.
4. Every portion of the stump

should be thoroughly cauterized with the cauterizing-point at a dull-red heat, after which the clamp should be loosened to see if bleeding occur (Fig. 4). If it does, the operator should readjust the clamp and cauterize all bleeding-points.

After all the piles have been removed in this way the rectum should be irrigated and a wedge-shaped compress placed over the anus and kept in place by a well-adjusted T-bandage.

When the piles are small or situated high up and cannot be drawn down

and the patient's suffering is less and recovery is several days earlier than after the ligature. When the ligature has been applied ordinarily it will not slough off before the eighth day; and, when it does, it leaves an ulcer with irregular edges, which not infrequently has a tendency to become chronic.

At best, patients are rarely able to be about the room before the tenth day, and frequently not for two weeks; while after the cauterizing method the ulcer will be clean and smooth shortly after the oper-



Fig. 2.—Dilatation of the sphincter ani. (*Gant.*)

and clamped, the narrow cauterizing-blade should be drawn once or twice across each pile; this will cause them to shrink up. The cauterizing may be applied, if used with discretion, to any dilated veins present that might at some future time form piles.

This operation is preferable to the ligature; not because the cure is more effective, or the operation less difficult to perform, but because of the facts that the operation can be performed more quickly, with greater ease and accuracy,

and will be practically healed by the time the ligature has sloughed off. Patients can sit up on the third or fourth day, and it is a rare occurrence if they are detained from business more than a week.

In many cases the time that is saved is represented by the length of time that it requires for the ligature to come away. Granting that some healing takes place while the ligature is sloughing, it will require as long for the remaining portion of the ulcer to heal as after the cauterizing

operation; for the ulcerated surface after the latter seems to heal more readily than after the former operation. The pain after the cautery operation is insignificant if care has been used to *avoid cauterizing the skin*; but when it has been touched, if only slightly, the pain is exceedingly annoying. Retention of urine occurs sometimes, but not so frequently as after the ligature. Slight bleeding sometimes occurs at non-cauterized points when the clamp has been removed,

of sepsis has been minimized by searing the exposed surfaces. So far as a radical cure is concerned, the cautery and the ligature operations are on a level, for when either one has been performed as previously described a permanent cure will follow in every case.

One hundred to one hundred and fifty hæmorrhoid cases seen both during and after the operation with clamp and cautery. Apart from the fact that none of them had a single bad symptom of any kind, there were three points chiefly re-

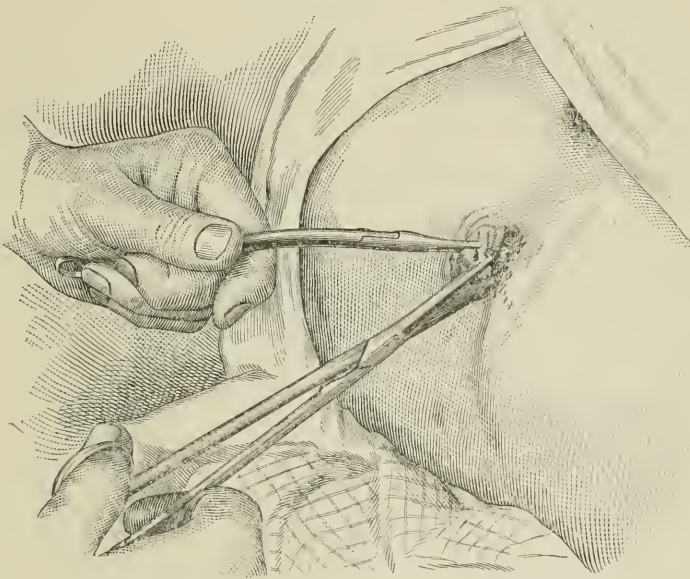


Fig. 3.—Severing the mucous membrane from the skin. (Gant.)

but it will not do any harm when a firm wedge-shaped compress is placed over the anus and supported by a well-adjusted T-bandage.

Experience has shown that hæmorrhage will occur just as frequently from the slipping of the ligature, when it or the stump has been severed too closely, as after the clamp-and-cautery operation.

It is not probable that either tetanus or pyæmia will follow the cautery operation, for there is no constriction of terminal nerve-filaments, and the danger

markable about them. First, the extremely small amount of blood lost; secondly, the trivial degree of pain afterward; third, the short time during which treatment lasted. Burghard (*Lancet*, Apr. 6, '93).

There is a decided advantage in favor of the clamp and cautery. Rarely, after this operation, is it necessary to prescribe an opiate. J. E. Davis (*N. Y. Med. Jour.*, June 15, '95).

Clamp-and-cautery method considered preferable to all others. H. R. Colston (*Virginia Med. Monthly*, Apr., '95).

The clamp-and-cautery operation can

be done expeditiously and with little loss of blood; the cauterized base of the pile is rendered aseptic by the cautery; there is no pain following the operation; retention of urine is extremely rare; convalescence is brief and uninterrupted,—confinement in bed from three to seven days is sufficient. Trowbridge (Boston Med. and Surg. Jour., May 30, '95).

[In two hundred and sixty-seven cases treated during five years at the N. Y. Post-graduate Hospital, the clamp-and-cautery method employed and preferred to all other procedures. CHARLES B. KELSEY, Assoc. Ed., Annual, '96.]

from which the patient recovered is recorded, and a few slight hæmorrhages; and, so far as can be ascertained, there have been no recurrences. Vaux (Canadian Pract., Dec., '96).

The writer's objection to the clamp-and-cautery operation is that in hæmorrhoids having a broad base the clamp picks up the hæmorrhoids and also a large portion of the mucous membrane, and on the removal of the clamp the edges of the mucous membrane separate and leave a large ulcer, which is slow to heal. George W. Crary (N. Y. Med. Jour., Feb. 12, '98).

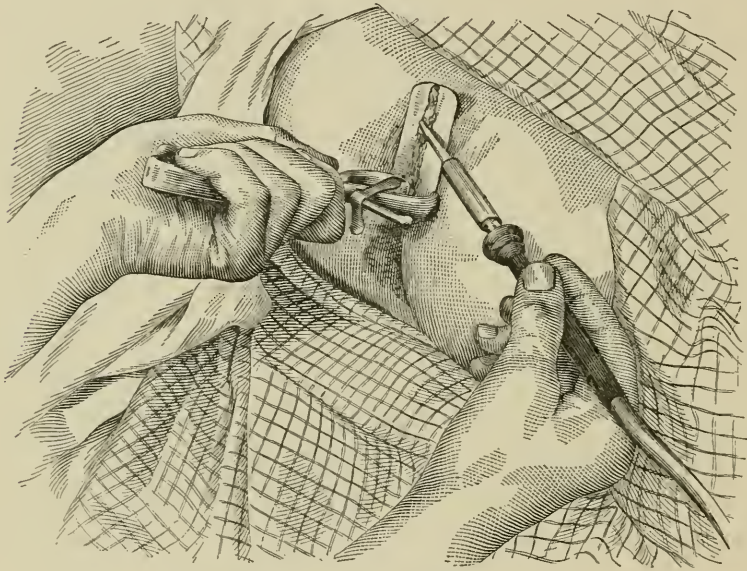


Fig. 4.—Cauterizing the stump. (Gant.)

Literature of '96-'97-'98.

Advantages of the clamp and cautery: It is antiseptic; there are no sloughs to separate as in the ligature operation; there are no ligatures or sutures to offer any chance for infection; it is a radical cure; the operation is a rapid one; the time of convalescence can be definitely fixed—the eighth day.

The record of hæmorrhage, pyæmia, or death is almost negative. In five hundred cases operated upon in Mt. Sinai, by the above method, there has not been a single death. One case of pyæmia

Clamps.—Until recently pile-clamps on the market were constructed like scissors. When that portion of a tumor external to the clamp was cut off, tissues except those nearest the heel slipped through before the operator had a chance to cauterize them. In this way patients were subjected to a serious, if not fatal, hæmorrhage.

Some three or four years ago the writer constructed a clamp with the blades at right angles to the handle (see

Fig. 5). This insures the blades' remaining parallel, distributing equal pressure, no matter how far apart they are, so that not the slightest portion of tissue can slip through and escape cauterization. When this clamp is used hæmorrhage is improbable, if not impossible.

AFTER-TREATMENT.—After any operation for piles a well-adjusted pad to the anus, held in place by a T-bandage, supports the parts and renders the patient more comfortable, and tends to arrest any bleeding that might otherwise take place. I do not use suppositories, although many high in authority recommend the immediate employment of suppositories containing morphine, opium, belladonna, etc., for the relief of pain. As a rule, they produce an uncomfortable feeling and cause the patient to strain in his endeavors to force them out. When I am compelled to use anything for the relief of pain I prefer an hypodermic injection of $\frac{1}{4}$ grain of morphine. Ordinarily, this will not have to be repeated. When the pad applied to the anus becomes dry and hard, the anus should be sponged off with warm water and a new pad applied.

If the patient has been purged before the operation, it is not necessary to check intestinal action with opium, for no movement will occur before the third day. In case it does not, a Sedlitz powder or a dose of salts should be administered. If there is reason to believe the fæces are hard, an injection of soap-suds should be given to soften them.

Patients should be urged to remain in bed until the ulcerations have almost or entirely healed. Then, when they begin taking active exercise, the danger of the ulceration's becoming chronic will be slight. The ulcerated surfaces should be cleansed daily, and, if there is the least tendency to become chronic, an applica-

tion of calomel or silver nitrate (15 grains to the ounce) will stimulate them.

In case of retention of urine, hot stupes or poultices should be applied over the pelvis. This will frequently enable them to void urine independent of the catheter. If a catheter is used, a soft-rubber one is preferable, but should be cleansed in boiled, filtered water before and after each introduction. The diet after an operation should be limited

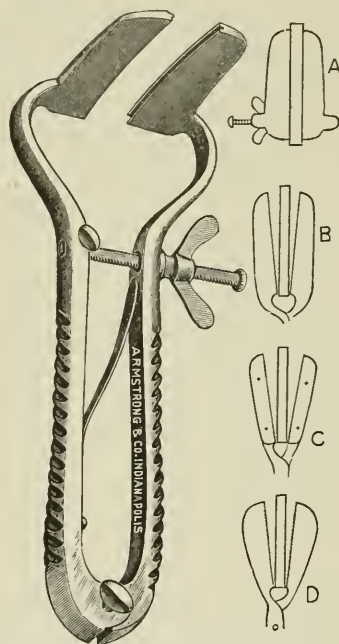


Fig. 5.—Gant's pile- and polypus- clamp. The letters show the different clamps and their clamping power. A, Gant's; B, Kelsey's; C, Smith's; D, Langenbeck's.

to liquids and semisolids for the first four or five days; but patients should have nourishing soups, beef-tea, and soft-boiled eggs.

Prognosis.—In cases where bleeding, inflammation, and strangulation have been relieved by palliative measures, patients should be warned that they will probably have another attack. On the

other hand, when all piles, dilated veins, and redundant tissue have been removed by the clamp-and-cautery or ligature operation, it is safe to tell them that they will not have a relapse.

Post-operative Hæmorrhage. — Occasionally after the best operations for piles the dressings will be saturated with blood. This, as a rule, need not cause

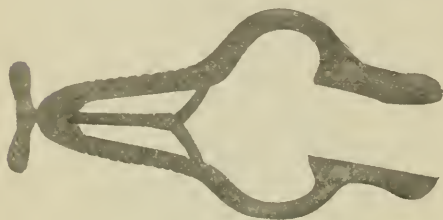


Fig. 6.—Gant's self-retaining speculum.

uneasiness, for when due to bloody water left in the rectum after irrigation or from a superficial cut in making the mucocutaneous incision it will not amount to anything. On the other hand, when internal bleeding is suspected, the patient should be requested to empty the rectum. If bleeding has occurred, clots of blood will be discharged with the fæces. When

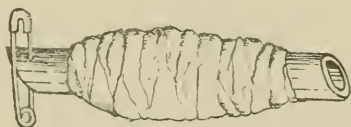


Fig. 7.—Drainage-tube wrapped with gauze.

there is reason to believe that the bleeding is due to a small vessel or to oozing, it can frequently be arrested by simply *tightening* the bandage. If this fail, the rectum should be irrigated for several minutes with cold or quite hot water, or with some one of the various astringent solutions, as alum-water, the infusion of black-oak bark, etc. Astringent pow-

ders dusted over the bleeding parts, tannic acid, gallic acid, zinc, Monsell's powder, and other powders known to have a contracting effect on the tissues have all been recommended. Monsell's powder has been used more frequently than the others, but it has proved very undesirable, not because it did not arrest the bleeding, but on account of the filthy condition in which it leaves the wound.

When the hæmorrhage is profuse, time should not be wasted on injections and powders. The rectum should be exposed by means of a speculum and the bleeding vessel searched for until it is found and ligated or seared over with the Paquelin cautery (Fig. 6). If the operator be

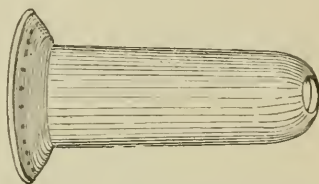


Fig. 8.—Vulcanite drainage-tube.

not so fortunate as to have one of these instruments, a poker or a curling-iron may be heated to a red heat and used as a substitute. In case the vessel is situated so high that a ligature cannot be applied, it should be seized with a pair of artery-forceps and thoroughly twisted, and the forceps left on if necessary; for in cases of profuse hæmorrhage of the rectum the patient's life not infrequently depends upon the thoroughness of the work.

In case the bleeding-point cannot be located packing of the rectum should be resorted to. This must be done carefully, however. Gauze or other packing loosely inserted into the rectum does not arrest the bleeding.

The majority of operations for hæmorrhoids are performed on the lower inch and a half of it. When bleeding occurs in this locality it can be speedily arrested by inserting into the rectum a firm piece of rubber tubing, three inches long and three-fourths of an inch in diameter, around which has been wrapped several layers of gauze. It can be kept in place by placing a safety-pin through the outer end and into a T-bandage. This makes a desirable compress and at the same time allows the escape of wind and discharges, and warns the attendant in case the bleeding has not been arrested (Fig. 7). Vulcanite tubes (Fig. 8), which are kept at most any instrument-dealer's store, act in the same way. The main factor in arresting hæmorrhage after any operation about the rectum, where the cautery or ligature cannot be used, is to make firm and constant pressure over the bleeding-points, so that not a single point of the rectum will be exempt from the pressure; when this has been accomplished, we can retire with the assurance that our patient is perfectly safe and that all bleeding has been arrested.

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HAMAMELIS.—Hamamelis, or witch-hazel, consists of the leaves of *Hamamelis Virginiana*, a North American shrub growing east of the Mississippi River. The leaves, collected in the autumn when the twigs are flowering, have an odor resembling that of tea and an astringent, bitter taste. It contains about 10 per cent. of tannin, bitter and odorous extractives, and a trace of oil.

Preparations and Doses.—The fresh leaves (hamamelis, U. S. P.) are used to prepare the fluid extract, which, although chiefly used as an external appli-

cation, may be given internally in doses of $\frac{1}{4}$ to 1 drachm.

Therapeutics.—Hamamelis is hæmostatic, astringent, and tonic in its action. Containing considerable tannin, it coagulates the albuminous elements of the tissues, when applied locally, and diminishes the blood-supply and secretions.

IN HÆMORRHAGE.—The fluid extract has been given internally for the relief of pulmonary, renal, and uterine hæmorrhage; purpura, hæmatemesis, varicose veins, and hæmorrhoids. The local application of hamamelis has been used for recent wounds, sprains, bruises, superficial hæmorrhage, hæmorrhoids, epistaxis, and for bleeding or discharges from the natural cavities or openings of the body.

AS AN ASTRINGENT.—Hamamelis is used, in diluted form, as a mouth-wash, as a gargle in chronic pharyngitis, and in spray after attacks of acute coryza (1 part to 8, or 1 part to 24). In relaxed conditions of the mucous membranes generally it is beneficial. Peristalsis and the secretions of enteritis are checked. It is of value in diarrhoea and dysentery.

HAY FEVER. See NASAL NEUROSES.

HEAD, INJURIES OF.

See also CEREBRAL ABSCESS, ENCEPHALITIS, FRACTURES, and WOUNDS.

Cerebral Contusions.

A contusion of the brain always accompanies any serious injury to the cranium. Such contusion can exist without necessarily having a fracture of the skull; but, on the other hand, a fracture of the skull is always accompanied by cerebral contusion.

Symptoms.—The symptoms of contusion of the brain, referring to loss of function, are characterized by their diffuse or generalized condition. Hence, they differ materially from those of com-

pression, which refer absolutely to distinctly-localized lesions. Vomiting often occurs after the injury. Respiration is superficial, but may be deep and stertorous. Fever has been observed in contusion of the brain, especially in case of injury or irritation of the median portion of the corpus striatum, and the mesencephalon, such as the posterior corpora quadrigemina and the sensory nucleus of the fifth nerve (Kocher).

It has long been a mooted question whether contusion could always be differentiated from concussion of the brain by any special symptom. Clinically this does not exist. In a general way the symptoms of concussion, resulting from a lighter form of traumatism, produce less material disturbance and are therefore more transitory, whereas in severe contusion the symptoms persist and are sometimes aggravated, because of the possibility of an encephalo-meningitis complicating the case. Loss of consciousness, partial or complete. Paralysis more or less complete of different portions of the body. A cold, clammy condition of the skin, a feeble, fluttering heart. After a few days these symptoms disappear gradually, depending upon the absorption of the extravasated blood. After recovery the patient may suffer for a time from vertigo, headaches, and loss of memory, in addition to a general debility and malaise.

Literature of '96-'97-'98.

Case of a boy, 15 years of age, who had fallen from a height on the left side of the head. He was never unconscious at any time, but aphasia with pain in the head gradually supervened, although vomiting never appeared. On the third day spasmodic cramps along the entire right side of the body commenced, but gradually disappeared.

On the seventh day motor aphasia was established, with difficulty in writing

and general disturbance of the muscular movements of the right side, while the sensory function was unaffected. At this time paralysis of the right facial and hypoglossal nerves was observed, with pain and jerking of the right hand. Over the suture corona there was a tender area, about the size of a shilling, which was slightly depressed.

Three days later the whole condition of the patient rapidly improved, and he began to speak as fluently and write as correctly as ever he did, while all spasmodic jerking and pain left him.

The writer could put no other construction on these remarkable circumstances than that a contused condition of the brain was the result of the injury which gradually brought about the paralysis by an effusion of blood from the median artery of the meninges that subsequently became absorbed as other hæmatoma. The rapidity of the recovery in this case lends weight to the expression that many of the cranial operations performed are quite unnecessary, as they would recover more satisfactorily if let alone. Frey (Med. Press and Circular, Aug. 19, '96).

Pathology.—Contusion does not necessarily bear a direct relation to the seat of injury. Bergmann maintains that when the traumatism has been applied over a large area, and violent enough to depress the skull, not only is there severe contusion, or laceration of the subjacent brain-structure, but the corresponding portion of the brain on the opposite side has likewise undergone considerable contusion, by the force's being transmitted through the brain, against the skull opposite the seat of injury.

The superficial layers of the brain are most likely to be affected, especially since the gray cortical substance is the most plentifully supplied with blood-vessels. In fractures at the base of the skull contusion of the brain exists mostly at the temporo-sphenoidal lobes. The occipital lobes are not so readily affected, on ac-

count of the protection offered them by the cerebellum. The following distinction exists between a spontaneous cerebral capillary hæmorrhage and that resulting from a contusion, viz.: In contusion the arachnoid is likewise a seat of hæmorrhage, owing to its share in the effects of the traumatism, while in spontaneous cortical hæmorrhage the meninges are not affected.

According to the violence of the injury will the character of the capillary hæmorrhage, destruction of tissue, and corresponding impairment of function vary. The hæmorrhage might be disseminated and punctiform, or more pronounced, giving a dark area with lighter boundary. Such a lesion as this, if examined microscopically, would give evidence of minute destruction of cerebral substance by the blood disseminated in the tissues.

Literature of '96-'97-'98.

A blow to the head produces a momentary increase of intracranial tension and consequent compression of the brain as a whole.

The effect of this compression would be to cause an interference with the blood-supply to the entire brain, and this is sufficient to account for the primary symptoms of cerebral concussion.

The so-called syncopic death after severe concussion is produced by a paralysis of the respiratory centres, the cardiac centres remaining intact. This fatal result may in many cases be prevented by the prompt institution of artificial respiration. S. P. Kramer (*Annals of Surg.*, Feb., '96).

Contusions may be limited to the meninges, or to the brain, or may involve both; there is no destruction of tissue and only slight extravasation of blood. When recovery occurs it is by absorption, not cicatrization. D. W. Day (*Northwestern Lancet*, Apr. 15, '98).

If left untreated such a condition would tend toward a process of absorp-

tion and gradual restoration of impaired function, provided there be no infection, either directly, because of the traumatism, or indirectly, on account of a latent diathesis which could, perhaps, implant itself on this locality. The minute hæmorrhages become encysted and disappear. In other words, should there be no fracture leading to a possible infection from without, or lurking diathesis leading to an infection from within, these contusions of the brain rarely lead to supuration or violent encephalitis. (See ENCEPHALITIS and CEREBRAL ABSCESS.)

Prognosis. — The prognosis depends altogether upon the presence or absence of infection and the general health of the patient. Should no disturbance be feared from these two causes, a gradual recovery is to be anticipated. On the contrary, should the destruction of brain-tissues have become infected, we may expect encephalitis and its results.

If the patient survive twenty-four hours recovery is likely to take place, so far as the direct effects of the concussion are concerned. Hutchinson (*Med. Press and Circular*, Dec. 20, '93).

Treatment.—Since the danger from contusion of the brain results from a permanent destruction of function, on the one hand, and infection on the other, the treatment will be directed toward obviating the possibility of these accidents.

Our guide will, therefore, be the violence of the symptoms. Should these indicate no absolute gravity from loss of function, such as complete unconsciousness, great depression, and paralysis, the reaction which the contusion necessarily creates in the cerebral tissues must be met as follows: Complete rest; head slightly elevated. The depression must be relieved by hypodermic injections of strychnine sulphate, $\frac{1}{40}$ grain every three hours until reaction takes place in the pulse. Hot-water bags are applied.

As soon as the patient is able to swallow, he should be given purgatives, which will, by depleting the circulation, promote the absorption of effused serum following the contusion of the brain.

In treating cases of concussion where there is great depression, ammonia-fumes to the nose, tickling of the nostrils, stimulants (brandy and warm water and black coffee per rectum), hot applications over the præcordia, and rubbing of the surface of the body are advised. In cases of great prostration life may be awakened by lowering the head, and, after sufficient recovery, remedies by the mouth may be given. Stimulants should be employed only during the period of depression, the inflammatory symptoms, which usually appear after a few days, being then controlled by proper measures.

Frequently two or three months are required for the entire recovery of the patient, and for a yet longer period limited exercise of the body and mind should be enjoined. Lane (*Jour. Amer. Med. Assoc.*, July 14, '94).

Literature of '96-'97-'98.

In the after-treatment of injuries of the cranium the main points to bear in mind are antisepticism and rest.

It must be premised that, so far as any wound is concerned, that has been treated by one of the methods of modern asepticism; but for general antisepticism one of the first considerations is to clear out the digestive tract, and for that purpose nothing is better than the calomel purge. Whatever the nature of the injury, as soon as reaction has set in, the intestinal tract should be cleared; and, if the lower bowel is loaded, a stimulant purgative enema is of great use.

The bladder must be looked after, and, if necessary, the urine drawn off. If the temperature should run high, and the skin be very hot, and the patient be very thirsty, diaphoretics may be administered and fresh lemonade or some cooling mineral water allowed, but nothing else. Very light dietary of great importance.

In some cases, especially where brain has been lacerated, small doses of morphia subcutaneously are very useful.

The head should be kept as cool as possible, by shaving or cutting the hair short, and by evaporating lotions or by ice; it should also be rested on a hard pillow, and is best kept well raised, and the room should be kept darkened. Chauncey Puzey (*Liverpool Medico-Chir. Jour.*, July, '96).

Should there be the slightest abrasion or wound of the scalp, even if unaccompanied by fracture of the skull, the strictest antiseptic precautions should be preserved, lest any infection from without provoke a meningitis.

Case of boy, aged 15, who fell fourteen feet upon a horse in stall below, and from thence to the ground, the horse kicking him several times. Patient found unconscious seven hours later; scalp, back of line drawn from tip of one auricle to the other, was torn off and hanging down upon neck, wound filled with manure, straw, hair, etc. Washed thoroughly with warm water, irrigated with bichloride 1 to 2000; put in sixteen stitches, and ten days later removed same. No pus, pain, nor fever. Recovery. J. N. Barney, Jr. (*Va. Med. Monthly*, Aug., '95).

Literature of '96-'97-'98.

Case of white girl, 2½ years old. A large farm-bell, on a post twenty feet high, fell, striking her head on the right side in front of the motor region. The bones were driven into the brain, to the depth of one and one-half inches, making a large jagged wound in both the dura and brain. There was not much hæmorrhage. Considerable bloody brain-tissue came away when the wound was washed out. The ragged edges of the dura were trimmed smoothly, but could not quite be brought together. All depressed bone was elevated or cut away. A drainage-tube was passed down to, but not into, the wound of the brain. No fever and an uninterrupted recovery. David Y. Winston (*Can. Lancet*, Dec., '97).

If the symptoms are much aggravated in a few days, showing cerebral œdema, and consequent autocompression of the brain against the skull, the indication then is to trephine over the seat of the injury and if necessary incise the dura for the relief of intrameningeal pressure.

The trephined opening may be enlarged by means of the Rongeur forceps, if the size of the contused area warrant the procedure; it is remarkable how much drainage of serum and possibly cerebrospinal fluid takes place under the circumstances, followed by gradual disappearance of the pressure symptoms. The subsequent treatment would then be as in less aggravated cases.

Cerebral Concussion.

Symptoms.—It is very difficult to establish clinically a distinction between concussion and contusion of the brain. However, concussion conveys the idea of the brain, as a whole, having been violently shaken under the effect of a traumatism, resulting in a disturbance of function, without any appreciable lesion of the brain-substance. The boundary between the two conditions must, therefore, be more imaginary than real.

Symptoms of concussion produced in animals without causing visible anatomical lesions in the brain or skull. Koeh and Filehne (*Archiv f. klin. Chir.*, vol. xvii, p. 190).

In the mildest grade of concussion there is a brief diminution of the blood-pressure in the part; its tension is temporarily lowered. If the violence is somewhat greater, then there is super-added to the former condition a disturbance of the cellular constituents composing the surface of the brain. A jostling or displacement of the molecular elements of these cells, even though it be microscopically minute, must suffice to induce functional derangement. If the violence is still greater, then, besides the abolition of the thinking faculty, the cardio-pulmonary functions are dis-

turbed, depending, doubtless, on the lesions of the centres at the base of the brain. In the still-higher grade the functions of life permanently cease at once, or within a few minutes after the receipt of the violence. Lane (*Jour. Amer. Med. Assoc.*, July 14, '94).

Concussion, due to a single blow or to repeated blows, is accompanied by the same effects upon the nerve-centres. If differences are manifest at the moment of the blow they can be readily explained and simply confirm this general law; the clinical condition is identical in the two cases. The analogy is visible even in the minutest detail that there is nothing to be added to the bulbar symptoms. Violent concussion produces great rapidity of heart-action. Nerve-centres under the influence of anæmia suffer the same changes as under the influence of concussions.

In conclusion, two facts are to be considered: first, the action of the violence upon the nervous centres; second, the vascular change produced by the effect of such violence upon the vessels. Where the latter is slight, great violence may do much less harm than a light blow under reverse circumstances. Death may even ensue without any actual discoverable lesion. August Polis (*Revue de Chir.*, Aug., '94).

The symptoms of concussion merge into those of contusion of the brain. In a word, they are milder and more transitory. There is a dazed condition, at the worst amounting to semiconsciousness, but at all times the condition is one from which the patient can be aroused on loud command or address. The pulse is rapid, there is general irritability and jactitation, deep sighing, and cold, clammy skin.

Miles has found from experiments that there is a temporary anæmia of the brain in concussion. This is the reflex result of the stimulation of the restiform bodies, and perhaps other important centres in the region of the bulb. These parts are stimulated by the cerebrospinal

fluid which rushes through the aqueduct of Sylvius, the foramen of Magendie, and the subarachnoid space to that of the concussion when a severe blow is dealt over the head. Hence this cerebro-spinal fluid will disturb the equilibrium of the ultimate nerve-cells throughout the nervous system.

Treatment.—The treatment resolves itself into meeting the indication, according to the symptoms of the particular case, as described under CONCUSSION.

Latterly it has been suggested to abandon the term "concussion" for that of "laceration" of the brain, inasmuch as it has been ascertained that minute lesions disseminated throughout the brain can be observed, where formerly there was supposed to be no appreciable lesion. (Phelps.)

Literature of '96-'97-'98.

In the milder cases of concussion of the brain scarcely anything is to be done further than to make the patient lie down a short time, with possibly a little cool water or cold compresses to the forehead. In severer cases the patient is to be put to bed with cold cloths or cold coil to the head, milk diet for a day or two, bowels kept open, absolute quiet enjoined, and, if needed, bromides or small doses of morphine given for rest and sleep. David Y. Winston (Can. Lancet, Dec., '97).

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HEAT-STROKE. See INSOLATION AND HEAT-STROKE.

HEMIPLEGIA. See PARALYSES.

HEPATITIS. See LIVER, DISEASES OF.

HERNIA.

Definition.—The term hernia is used to denote the protrusion of one or more

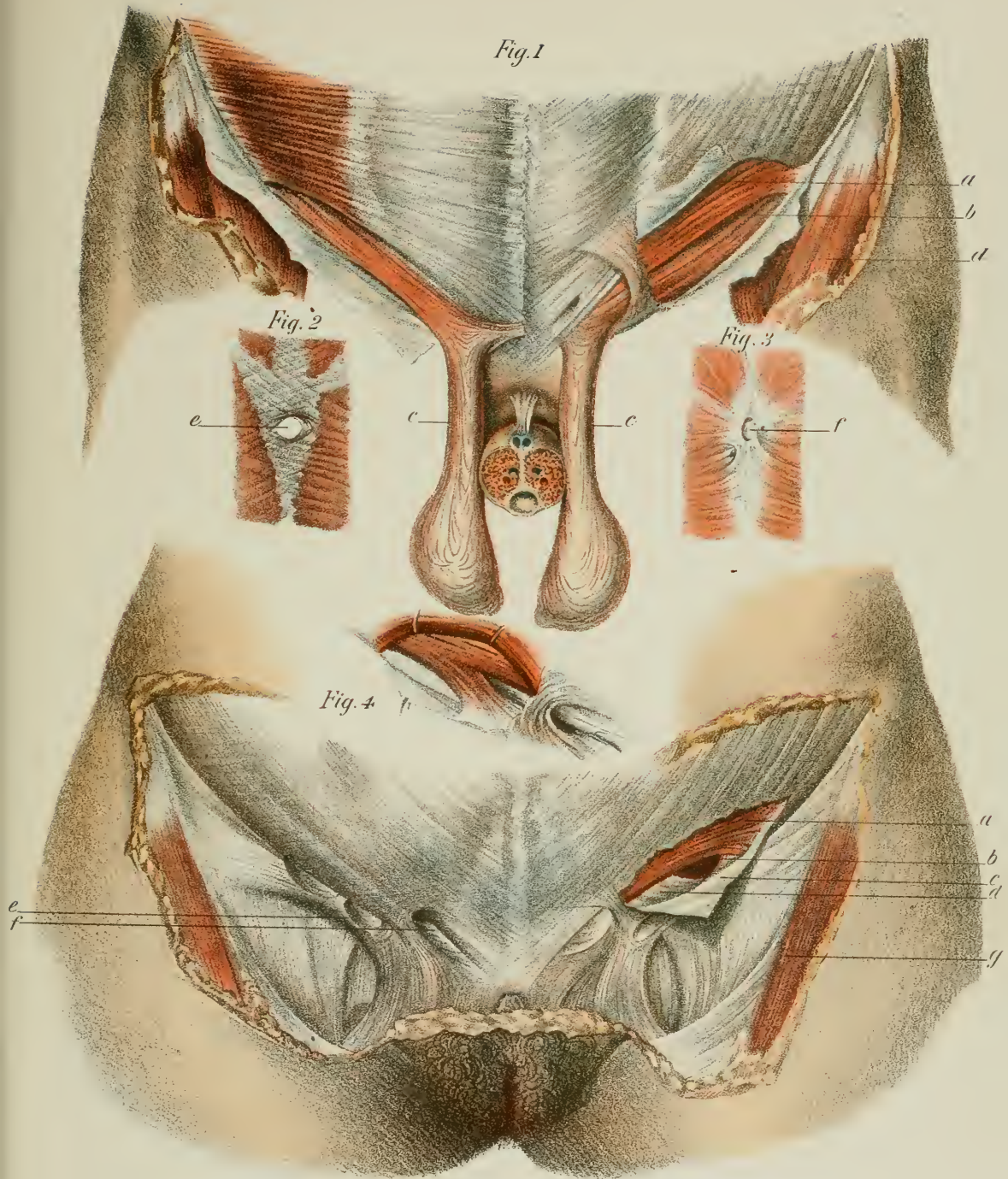
of the abdominal viscera, and is synonymous with the ordinary term "rupture."

Varieties.—If the protrusion occurs through openings in the abdominal wall which, normally patent in foetal life, through some defect in development have failed to close at birth, the hernia is said to be *congenital*. The protrusion may also occur at other points in the abdominal wall, by nature weaker than elsewhere, namely: in the femoral region, in the inguinal canal, and at the umbilicus. In these cases the rupture may be said to be *acquired*.

In addition to these varieties we have ventral hernia following abdominal incisions or accidental wounds. This variety is frequently known as traumatic. A hernia takes its name from the site of the opening through which it protrudes. The common forms are: *inguinal*, *femoral*, *umbilical*, and *ventral*. The rare forms: *diaphragmatic*, *lumbar*, *obturator*, *ischiatric*, *pudendal*, *perineal*, *properitoneal*, and *retroperitoneal*.

Distinction is often made between *external* hernia, including all the varieties above mentioned, and *internal* hernia, by which latter is meant the protrusion of a viscus through some anomalous pouch in the peritoneum.

Surgical Anatomy.—A hernia consists of a sac, the coverings of the sac, and contents. The sac is always a prolongation of the parietal peritoneum; it varies in size and shape according to the stage of the hernia. At first it is merely a pouting or bulging into the hernial orifice: narrow at the end, wide at the base. As the hernia extends and emerges from the orifice, the sac is elongated, and from the pressure of the contents the lower portion becomes globular or pyriform in shape. The narrowest part of the sac is called the neck, and the external, or distal, portion is called the fundus. A



Surgical Anatomy of Inguinal Hernia.

- Fig. 1, *a*. Internal Oblique, *b*. Internal Ring, *c*. Spermatic Cord, *d*. Sartorius Muscle.
 Fig. 2, *e*. Internal Aspect of Abdominal Orifice.
 Fig. 3, *f*. Internal Aspect of Permeable Region in Abdomen.
 Fig. 4, *a*. Internal Oblique, *b*. Internal Ring, *c*. Fascia of External Oblique, *d*. Transversalis Fascia
e. Crural Arch and Ring, *f*. External Ring, *g*. Sartorius Muscle.

sac formed in this way—namely, by a gradual pushing forward of the parietal peritoneum—is said to be acquired, while a congenital sac is preformed, the protrusion occurring in the open tunica vaginalis or through the patent navel. A congenital hernia, while it may appear late in life, is dependent upon conditions which existed at birth.

Adhesions may occur between the sac and its contents. The sac may become greatly thickened and opaque,—usually owed to the irritation of an ill-fitting truss,—and may undergo calcareous or malignant degeneration. Certain hernias are said to have no sac,—as, for instance, hernia of the bladder, sigmoid flexure, or cæcum. This is not entirely true; a sac exists, but the peritoneum does not completely surround the viscus.

The coverings of the sac are made up of the different layers of tissue outside of it. These, of course, vary according to the site of the hernia. An accurate knowledge of these layers is becoming more and more necessary to the surgeon, owing to the increasing importance given to modern methods for radical cure. (*See Colored Plate.*)

Every viscus, except the pancreas, has been found in some variety of hernia. The contents are usually made up either of intestine or omentum, or both. If the hernia is reducible, the bowel and omentum present a normal appearance; but if irreducible and the hernia is of long duration, numerous pathological changes are likely to occur. The omentum becomes thickened and adherent to the sac, usually at the neck, or to the bowel, if that be present. A small amount of serous exudate is not infrequently present in an irreducible hernia. If the hernia contains omentum alone, it is called an *epiplocele*; if bowel alone, an *enteroceles*; if both are present, *entero-epiplocele*.

Etiology.—About 25 per cent. of persons with a rupture give a family history of hernia; while 40 per cent. are ruptured before the age of 35, 60 per cent. after that age.

Family history of hernia has not often been brought forward. Case in which patient's both parents had been affected,—the father with the right scrotal hernia common to his father, brother, and son; the mother also had a femoral hernia. It would seem most probable that the lad inherited his defect—overpatent inguinal rings—from his father, but the laxity of tissue present in his mother's case and shared by his sister, as shown by their possession of femoral hernias, may have counted for something in the size of the protruded mass. J. Kynaston Couch (*Lancet*, Oct. 26, '95).

The occupation is an important factor in causing hernia; those trades requiring the most severe muscular effort having the highest proportion of persons ruptured. The increased liability to muscular strain in men is undoubtedly an important factor in explaining the greater proportion of ruptures in male than in female subjects. Parturition is a frequent cause in the female, especially of umbilical hernia.

* There were 7433 cases of hernia met with in the male and 2534 in the female during a period of three years' consultation at the Central Bureau of Assistance in Paris, among patients applying for bandages. Inguinal hernia constituted 96 per cent. of these cases, 6220 of the men suffering from this form, double in 4126 cases, and single in the rest, occupying the right side in preference to the left in proportion of 1.46 to 1. Of all the cases a congenital origin could be definitely ascertained in only 479 cases. Berger (*La Sem. Méd.*, Oct. 26, '95).

The frequency is independent of race, but appears to be in relation to easy circumstances or the reverse. Among members of the literary profession hernia is rare. Between ages 5 and 15 the condition is uncommon. After 40 years

of age the proportion rapidly increases. Bertillon (*Le Bull. Méd.*, Dec. 4, '95).

Literature of '96-'97-'98.

Inguinal hernia is much more common in the male, and the reason for this is undoubtedly the fact that in man the inguinal canal is so much larger than it is in woman on account of the passage of the spermatic cord through this canal. On the other hand, femoral hernia is much more common in women because of the relaxation of the abdominal wall in all directions, due to child-bearing, and also because of the difference in anatomical structure. The female pelvis is much flatter and more horizontal than that of the male, consequently Poupart's ligament is relatively longer and tends to make the femoral canal wider and consequently weaker. Garrigues (*Med. News*, Jan. 22, '98).

Anything that tends to weaken the abdominal walls may be the indirect cause of hernia; for example, traumatism followed by the formation of cicatricial tissue, contusions, obesity, ascites.

Literature of '96-'97-'98.

Hernia may be caused by obesity. Recent deposits of fat are composed of a material which at the temperature of the human body is liquid, and is, therefore capable of transmitting pressure in every direction, which transmission is eminently favorable to the expansion of canals and the yielding of weak parts.

In very stout subjects the subperitoneal fat occupies much of the abdominal cavity, compressing and displacing its normal contents, and hindering their expansion.

Marked obesity produced rapidly in a subject between 15 and 30 years of age should excite dread of the existence of hernia, and lead to an examination of the inguinal and crural rings.

Course of preventive treatment recommended: a spare mixed diet, active exercise, attention to the renal functions, frequent and regular purgation, strict abstinence from alcohol, and the frequent administration of iodide of potassium in

small doses. Lucas-Championnière (*Bull. de l'Acad. de Méd.*, No. 33, '96).

The chief exciting cause of hernia is a sudden strain; the larger proportion of hernias, especially in adult life, come on soon after some unusual effort. The hernia generally begins with a slight fullness over the canal, often associated with a little soreness or feeling of discomfort. In rare cases a fully-developed hernia may immediately follow sudden strain.

Two cases in which strangulation occurred simultaneously with the first appearance of the hernia are quoted by Bull and Coley (Dennis's "System of Surgery," vol. iv).

Indirect causes of hernia are chronic bronchitis, pulmonary affections in general, and habitual constipation.

Reducible Hernia.

Diagnosis.—A reducible hernia usually presents the following signs: A soft tumor or swelling is found in one of the hernial openings; this swelling disappears on lying down, or on moderate pressure. It gives a distinct impulse on coughing, and usually it is seen to increase in size during the act of coughing or straining of the abdominal muscles.

In most cases there is a history of gradual development with sensations of discomfort in the region of the swelling, especially noted after long standing or walking. In the early period of development nothing more than a slight fullness may be found; but as the hernia descends it becomes a well-defined tumor. The character of the swelling varies according to the contents of the sac. If it contains bowel alone, it feels smooth and elastic; the impulse on coughing is well marked and reduction is often accompanied by a gurgling sound. Percussion yields a tympanitic note distinctly dif-

ferent from the flat sound produced in omental hernia. If the contents consist of omentum alone, the tumor is more uneven in outline, gives a lobulated feeling and is entirely without elasticity. Both bowel and omentum may be present, in which case there may be a combination of the physical signs already described. Not infrequently the bowel is perfectly reducible, while the omentum is adherent to the sac. The sensations of discomfort and the dragging pain, which may be very slight in a rupture of small size, may become very marked in a large hernia, especially if the latter be not controllable by truss.

Treatment of Reducible Hernia.—The various methods for the treatment of hernia may be classified as either palliative or operative. Palliative, or mechanical, treatment includes all the various appliances by means of which an effort is made to restrain the contents of the abdomen within the hernial orifice. In the majority of cases mechanical treatment does not aim to close the orifice, though in children and young adults such a result is often obtained, thus effecting a permanent cure.

TRUSSES.—No description need be given of the great variety of trusses. The object to be accomplished by a truss should be the complete retention of the hernia without causing discomfort to the patient; there are many forms of trusses which fulfill this object satisfactorily. A good truss should consist of a pad to cover the hernial orifice and a spring or band to hold the pad always in the proper position. Steel is, I believe, the best material for this purpose. A spring should surround the pelvis entirely or in part, and should be so constructed as to retain its place either by its own elasticity or by the aid of a strap. The two forms of trusses which I consider to best

meet the requirements of an ideal truss are the so-called Knight, or cross-body, truss and the Hood. Both these varieties may be used for single or double truss, and the Knight is quite as satisfactory in femoral as in inguinal hernia. The Hood pattern can be used only in inguinal.

The pad may be made of hard rubber, celluloid, cork, or of wood, covered with leather. Some cases not retained by this variety of pad may be satisfactorily controlled by the substitution of a so-called water-pad. These trusses may be made of any size and may be used in the youngest infants without discomfort. In infants and children great care should be taken that the spring be not too strong. The spring itself may be protected by leather, rubber tubing, or hard rubber. In rare cases—for example, emaciated infants—the worsted truss may serve a useful, but temporary, purpose. For routine work it is much inferior to a properly-constructed steel truss.

The truss should be so applied that the pad rests over the internal ring rather than upon the pubic bone. In scrotal hernia it is better to apply the truss in the horizontal position, care being taken that the contents of the rupture be entirely reduced before the truss is put on. In incomplete rupture this is not so important. In infants and young children the truss should be worn both day and night. In adults it may be, in most cases, removed with safety on retiring. Careful attention to the skin beneath the pad is important, especially in children; frequent bathing with alcohol will be found of great service.

One cannot state definitely how long a truss should be worn. It depends largely upon the age of the patient and the size of the rupture. A very large proportion of infants and young chil-

dren may be cured if treatment is carried out under favorable conditions.

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Under 12 months of age the cure by truss is 58 per cent.; from 1 year to 5 years, only 10 per cent., and after that practically *nil*; in acquired hernia the truss-cures at 15 years are 5 per cent., and at 30 years only 1 per cent. C. H. Golding-Bird (Practitioner, Jan., '96).

After puberty cases of cure become fewer in number, and beyond 20 years of age it may be safely stated that there are few permanent cures by means of a truss. At the Hospital for Ruptured and Crippled a truss is seldom left off in children until a period of two years has elapsed after the last appearance of the rupture. In infants under 1 year of age the truss may be left off sooner. In young adults the period should be lengthened rather than shortened, and after the age of 20 few cases will be found in which it is safe to discontinue the use of a truss. There is a certain class of cases in which no form of truss will retain the rupture. This applies to very large, scrotal herniæ with opening sufficiently large to admit four or five fingers. These herniæ are usually found in middle-aged and elderly people. Operation is in the majority of such cases contra-indicated, and the most we are able to do in the way of affording relief is a scrotal bag made of stout material and supported from the shoulders.

When a truss satisfactorily keeps up a hernia no surgical interference is necessary, and there is no doubt that well-trussed hernias in children have a strong tendency to become cured. Rushton Parker (Brit. Med. Jour., Sept. 21, '95).

The following conditions may give rise to persistence of symptoms after the apparent reduction of a hernia, and may demand the performance of median abdominal section: (1) reduction *en masse*;

(2) non-recovery of gut with consecutive enteritis; (3) gangrene of bowel; (4) an internal strangulation within a hernial sac, the taxis having overcome the external stricture; (5) hour-glass contraction of sac and reduction of hernia from the outer compartment into the inner, but not from this into the peritoneal cavity; (6) the presence of a second hernia which has escaped observation. Mayo Robson (Practitioner, June, '93).

The mechanical treatment of umbilical hernia differs with the age of the patient. In infants and young children no form of belt or truss is satisfactory, for the reason that it seldom retains its place for any length of time. The treatment used at the Hospital for Ruptured and Crippled is to apply a small pad, consisting of a wooden button-mold covered with leather, to the hernial orifice. This is held in place by a strip of rubber plaster two inches in width, which entirely incloses the abdomen. Care should be taken that the plaster be not applied too tightly and it should be changed at least every ten days. It seldom causes excoriation, and in most cases the rupture will be found to have disappeared at the end of six months or a year. Very few cases go beyond puberty without being cured, and hence the impropriety of operating upon these cases.

Irreducible Hernia.

Any form of hernia may become irreducible. This condition is, however, more frequently found in umbilical than in any other variety of hernia. It is exceedingly rare in children and young adults, and most frequently found between the ages of 30 and 60. In irreducible hernia the contents are most frequently omentum, omentum alone occurring in 90 per cent. of the cases. Omentum with bowel—entero-epiplocele—occurs next in order of frequency. Enterocoele—bowel alone—may become

irreducible with numerous adhesions, but this condition is rare.

Clinically, irreducible hernia differs but little from reducible hernia, which has already been described, except in the fact that the contents of the sac cannot be replaced in the abdominal cavity. Persons suffering from this form of hernia are liable to frequent attacks of colic, and are almost always subject to constipation. In this variety of hernia inflammation and strangulation are more likely to occur than in reducible hernia.

Treatment of Irreducible Hernia.—If the hernia is not too large and the patient is a good subject for operation, an attempt may be made to effect a radical cure. Mechanical measures are, as a rule, very unsatisfactory. No form of irreducible hernia can be treated with an ordinary truss without much discomfort. A truss fitted with a concave pad often proves satisfactory in irreducible hernia of small size; in umbilical and ventral, a stout abdominal belt with a circular, flat pad, with a slightly-concave pad in herniæ of larger size, will furnish all the relief we are able to give for this class of cases.

If the hernia has been down but a few days and there are signs of local inflammation, the patient should be kept in bed for a few days and an ice-bag applied. In using an ice-bag in these cases where the vitality of the skin is more or less impaired, one should always see that the ice-bag does not rest directly upon the skin, otherwise serious sloughing may ensue. Gentle taxis may be used during the course of this treatment, but it should be of only brief duration and never violent. In very many cases of irreducible hernia a larger or smaller quantity of serous exudate accumulates in the sac. This has been removed by aspiration. Still, while there is no objection to with-

drawing the fluid by means of a small needle if the hernia is purely omental, little is to be gained by this procedure. If the rupture cannot be reduced in one or two weeks, it may be regarded as permanently irreducible, and either operation or suitable mechanical support should be employed according to the nature of the case.

[Macready's tables show that 53 out of 85 cases of inguinal hernia were reduced within, on an average, of 51 days; 32 within, on an average, of 2.8 years. These results show the advantage of operation, unless there is some decided contra-indication. WILLIAM B. COLEY.]

In irreducible inguinal and femoral hernia a very large number of patients are good subjects for operative treatment; that is, they are under 50 years of age and the hernia is of moderate size, varying between that of a hen's egg and two fists. The results of operation in these cases are extremely satisfactory, and, as far as my personal experience goes, results have been as good as in reducible hernia in patients of similar age. On the other hand, not a few cases, especially of umbilical and ventral hernia, are old epiploceles of very large size in very stout women with a great excess of fat in the abdominal walls. In such patients, as well as in those who are weakened by disease of the thoracic or abdominal viscera, operation should not be resorted to, and our efforts should be confined to preventing the rupture from increasing in size. I have always believed that there was great risk in operating upon very large irreducible hernia. This opinion is supported by the early experience of Banks and the recently-published results of Barker. I have known of several unpublished cases of this kind in which death resulted from the operation. In addition to the great

risk there is little prospect of a permanent cure.

Strangulated Hernia.

The term "strangulated" is applied to an irreducible hernia in which the loop of bowel is so constricted as to prevent the passage of faecal contents and to interfere with the circulation.

The most common causes of strangulation are heavy lifting, severe coughing, and straining. It may also be produced by a blow or a fall.

Study of statistics of 1491 cases of strangulated hernia. Up to 20 years strangulation is rare, but gradually increases until between 50 and 70 the largest number occur. The causes of



Double direct hernia.

strangulation are severe cough or bodily exercise, defecation, pregnancy, and difficult labor.

Strangulation occurs more frequently in crural than inguinal hernia, 57.6 per cent. to 40.2 per cent., respectively; 51.2 per cent. of the hernial sacs contain small intestine only, 5.4 per cent. only omentum, 29.8 per cent. contained both of these. Lipomata found in 9 per cent. of the cases. Oscar Henggeler ("Statistics of 276 Cases of Strangulated Hernia Operated upon in the University Clinic at Zurich from 1881 to 1894").

In irreducible hernia strangulation often results from inflammation or engorgement of the contents of the sac, or from adhesions formed between the sac and its contents.

It is unnecessary to mention the various theories that have from time to time been offered in explanation of the way strangulation is brought about. The best and simplest explanation is that of venous engorgement: the walls of the veins being more compressible than the walls of the arteries, blood continues to flow into the imprisoned loop of bowel long after its return has been cut off. This produces great engorgement and rapid exudate of serum into the hernial sac, which makes reduction more and more difficult. The bowel first becomes of a brighter red, later bluish, then mahogany, and, finally, just before gangrene sets in, of a dull slate color. The exudation, which at first is clear, after a longer or shorter interval becomes turbid. Gangrene may occur at varying intervals, depending upon the tightness of the constriction, the earliest time within which it has been observed being four hours and the latest two weeks. The fluid in the hernial sac frequently contains bacteria, although in the larger proportion of cases thus far investigated, it has been sterile.

Bacteriological study of 9 cases of strangulated hernia. In 6 cases no bacteria had apparently traversed the intestinal wall. In 3 bacteria were found in the fluids of the hernial sac. In the 6 cases in which no bacteria were found, strangulation had existed 8, 18, 24, 30, 40, and 132 hours, respectively. In 1 case the intestine had undergone marked alteration. Conclusions that in non-gangrenous hernia bacteria are seldom found in the fluid. The intestines may undergo very grave changes and still be impervious to bacteria. Sjunggren (*Revue Inter de Bibliographie*, Mar. 10, '94).

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Study of a number of strangulated hernias, with reference to the bacteriological contents of the hernial fluid, in

the cases occurring in Koerte's wards in Berlin:—

1. The water of strangulated human hernia contains micro-organisms much more frequently than we have been justified in supposing from previous publications.

2. The bacteria of hernial water are frequently few in number and exist in a condition of diminished vitality, perhaps as the result of the bactericidal action of the water.

3. As a result of this action of hernial water upon the micro-organisms, proper investigation presupposes a cultivation upon a fluid nutrient medium.

4. The presence of the bacteria in hernial water appears to stand in close relation with all the factors which threaten the vitality of the strangulated parts in a special way. Brentano (*Deut. Zeitsch. f. Chir.*, B. 43, H. 3, '96).

Symptoms of Strangulated Hernia.—

The first symptom is usually pain, referred to the irreducible tumor at the site of the hernial orifice. Upon examination the tumor is found tense, and very tender on pressure; it gives no impulse, or, at most, a slight impulse on coughing. If the strangulation has existed but a short time, the tumor will give a resonant note on percussion. Later this sign may be absent, owing to an accumulation of fluid in the hernial sac. In some cases the pain is referred to the umbilicus rather than the hernial tumor.

Of all symptoms, vomiting is the most important. Vomiting is always persistent, occurring at longer or shorter intervals. At first the vomitus consists merely of the contents of the stomach; if the hernia is not reduced, it contains bile, mucus, and finally becomes stercoraceous. Complete constipation is always a symptom of great importance. In rare cases diarrhoea may occur as an early symptom. There is always an increase in the pulse-rate and usually slight ele-

vation of temperature, especially in the early cases. Later on temperature may become subnormal.

In strangulated omental hernia, with strangulation of omentum alone,—an extremely rare condition,—all of the symptoms are milder in character. Constipation may or may not exist.

[I have recently observed one case of acute strangulated omental hernia in which operation was performed on the third day. WILLIAM B. COLEY.]

Diagnosis of Strangulated Hernia.—

There is no condition likely to be met with in surgical practice in which it is more important to make an early and correct diagnosis than in strangulated hernia. In typical cases, fortunately, the diagnosis is attended with little difficulty. In a hernia previously irreducible, the condition of obstruction or inflammation of the hernial contents may cause one to suspect strangulation. In obstructed hernia, however, the impulse is usually present; pain is less acute and the other symptoms are much less marked than in the case of true strangulation. The same is true of inflamed hernia. Strangulation sometimes occurs synchronously with the development of a hernia; I have observed two such cases. Given a patient with the symptoms of intestinal obstruction, careful examination should be made of all the sites at which a hernia might occur.

HYDROCELE OF THE CORD.—In the young there is a condition to which attention has been seldom called, and that not infrequently in the hands of the general practitioner causes a mistaken diagnosis of strangulation. This condition is hydrocele of the cord. In this disorder the swelling is more tense and cystic to the touch; it is more freely movable, more globular in outline, and has a more sharply-defined upper border, which,

upon careful examination, shows that it does not enter the abdominal cavity. In a very few cases it may be difficult to differentiate between the two conditions from physical signs alone, but invariably the clinical history of the swelling will render the diagnosis easy. If hydrocele of the cord, there will be absolutely no general symptoms, and, if the statements of the parents be of any value, it will be found that the swelling has existed for several days or weeks, which shows the impossibility of its being a hernia.

[I have operated upon seven cases of strangulated hernia in infants, and in every case the general symptoms have been so well marked that mistaken diagnosis would have been impossible. WILLIAM B. COLEY.]

Treatment of Strangulated Hernia.—

Taxis.—Taxis and operation comprise the only methods of treatment to be considered. Taxis judiciously applied should always be used before operation is advised. Various positions of the patient are supposed to be of advantage in performing taxis. In inguinal hernia the pelvis should be elevated and the thighs flexed; in femoral hernia the thighs should be flexed and slightly rotated inward; in umbilical hernia both thighs should be flexed in order to relax the abdominal muscles. Traction on the tumor, followed by pressure, will often aid in reduction.

[Some, notably Hern, advocate withdrawing the fluid from the hernial sac by means of a fine hypodermic syringe prior to taxis. Out of 33 cases thus treated reduction was accomplished in 29. He advises this method only in cases of recent strangulation and which refuse operation. It certainly should not be advocated as a routine treatment. WILLIAM B. COLEY.]

In 63 cases of strangulated hernia 53 were reduced by local etherization. The patient is laid on the back, pelvis slightly elevated, and thighs bent, the parts

around being protected by abundant smearing with olive-oil; every ten minutes or so a tablespoonful of sulphuric ether is poured on the hernial ring and tumor, until the latter loses its tightness and diminishes somewhat in size, when it returns spontaneously, or with slight help. Omental herniæ will not yield to this treatment. Finkelstein (Berliner klin. Woch., No. 19, '91).

Ether irrigations advocated as an excellent means for reduction of strangulated hernia. A teaspoonful of ether is poured over the hernial tumor every quarter or half hour, keeping it covered with compresses during the interval. As a rule, after 3 or 4 tablespoonfuls, the intestinal loop slips into the abdominal cavity. In incarcerated scrotal hernia it is advisable to irrigate with a mixture of ether (20 parts) and hyoseyamus-oil (4 parts). Drakin (Proceedings Krakow Med. Soc., No. 10, '88).

General anæsthesia should, as a rule, be avoided in cases of strangulated hernia in old and exhausted subjects. Keetley (N. Y. Med. Jour., Nov. 18, '93).

For the performance of taxis it is better to place the patient on a table so slanted as to raise the hips; to crowd the abdominal contents toward the chest; to apply one hand to the neck of the tumor and the other to its body, and to draw it down so as to lengthen it out, at the same time compressing it. The utmost gentleness is essential. De Garmo (The Post-graduate, Sept., '92).

In strangulated hernia the patient should be placed in a hot pack, with ice over the hernia, $\frac{1}{2}$ grain of morphine being given by suppository. If, after three hours, a gentle attempt at taxis fails, herniotomy should be resorted to at once. Morison (Birmingham Med. Review, Sept., '92).

Violent or prolonged taxis is attended with great risk; the bowel may be lacerated or so severely contused that gangrene ensues. Often the sac has been ruptured by too forcible taxis. Methods of taxis which were perfectly justifiable twenty years ago when the mortality

from operative treatment was very high, are no longer to be tolerated.

[Frikhoffer gives a mortality of 14.9 per cent. in 308 cases of femoral hernia successfully treated by taxis; 7.8 per cent. in 518 cases of inguinal hernia. WILLIAM B. COLEY.]

In cases that have been irreducible prior to strangulation—as is generally the case in strangulated umbilical hernia—taxis is clearly indicated. In cases where strangulation has lasted for twenty-four hours or longer, no attempt should be made to reduce the hernia.

Taxis should seldom be employed longer than from three to five minutes, and then only moderate force should be used. The application of an ice-bag (hot cloths are preferable in children and old people) may facilitate reduction. In infants and young children it is a good rule, after an unsuccessful attempt to reduce the hernia by taxis, to immediately prepare for operation, and then, if reduction under an anæsthesia be not successful, operation may be at once performed without subjecting the patient to a second anæsthetization.

Operation for Strangulated Hernia.—**INCISION.**—Instead of the old incision over the most prominent part of the tumor, usually the upper scrotum, even now employed by many surgeons, it is much better to make the ordinary Bassini incision, parallel to Poupart's ligament, extending only slightly beyond the external ring. This incision is carried down to the aponeurosis of the external oblique, which is slit up about two inches.

SAC.—The sac is next exposed by careful dissection and opened by a scalpel or scissors. On opening the sac a smaller or larger quantity of fluid almost always escapes. The character of this fluid should be carefully noted, inasmuch as

this gives an important indication as to the condition of the bowel. If the bowel is simply congested, the fluid will be clear; if inflammatory changes have taken place, it will be turbid, but free from odor; if the intestine is gangrenous the fluid is sero-purulent and almost always has an intestinal odor.

DIVISION OF CONSTRICTION.—Before attempting to reduce the bowel the constriction must be divided. This may be either the neck of the sac or the fibrous structures forming the external ring, which have already been slit up.

[The older writers on strangulated hernia have uniformly regarded the neck of the sac as the chief cause of the constriction, and, with the methods of performing herniotomy formerly employed, it is easy to see how difficult and almost impossible it was to tell definitely whether the constriction was caused by the neck of the sac or by the external ring, both being cut at the same time by the old-fashioned herniotomy-knife. WILLIAM B. COLEY.]

Literature of '96-'97-'98.

Strangulated hernia in infants is not unlikely to occur while the infant is at rest, and in infants vomiting it is so common that a strangulated hernia may easily be overlooked. The scrotum may be congested or inflamed very early, even though the bowel be but slightly damaged. Especial care is necessary in the operation on account of the extreme thinness of the sac and the very small quantity of fluid in it. The return of the bowel after division of the stricture may be helped by lifting the child's feet. The bowels are likely to act soon after the operation, and to be somewhat relaxed for a few days. In every case a radical cure should be made at the time of the operation, unless the child is so collapsed that it is dangerous to prolong the operation even for a few minutes. Paget (West London Med. Jour., Apr., '97).

By performing the operation as indi-

cated, the constriction caused by the external ring disappears with the slitting up of the aponeurosis of the external oblique.

[If the real cause of the constriction were due to the neck of the sac, it would still be impossible to reduce the hernia. In every one of my seven cases (in children) the aponeurosis was widely opened, and this alone was sufficient to render reduction of the hernia easy, which would have been impossible had the constriction been due to the neck of the sac. This view, as I have stated, is directly contrary to the teachings of most writers. Tariel states that, out of 81 cases of strangulated hernia in children which he collected, the neck of the sac was regarded as the cause of the constriction in 58 cases. WILLIAM B. COLEY.]

MANAGEMENT OF THE CONTENTS.—

The bowel should be treated with the utmost gentleness, and a warm towel should be frequently applied until it is reduced. If the serous coat is still smooth and glistening, it may be safely reduced; purple or mahogany color—provided it has not lost its elasticity—is not a contra-indication for replacing it in the abdominal cavity. In cases of doubt as to the propriety of returning the bowel, it is well to apply a hot towel for a few minutes, the constriction having been relieved. If the circulation materially improves, it can be returned with safety.

If the peritoneal coat is granular and devoid of lustre and remains cold after the division of the constriction, it would be the better plan not to return the intestine, but to allow it to remain in place, protecting it by a sterile dressing. Examination a few hours later will determine whether it has sufficient vitality to permit of its being returned with safety into the abdominal cavity.

If the bowel is gangrenous, and there is no doubt that it is unsafe to return it, two methods of procedure may be

adopted: Primary resection may be performed, or the gangrenous knuckle may be left in place. If left in place, there is no need of sutures, as the adhesions will be sufficient to prevent it from slipping back into the abdomen. The gut may be simply opened and the wound fully protected with antiseptic dressing, the gangrenous knuckle may be removed, and the cut ends of the gut fastened to the skin by means of sutures.

[It is very difficult to lay down any absolute rule as to which mode of procedure should be adopted. While collected statistics somewhat favor the operation of primary resection, it is probable that the cases treated by artificial anus were the more desperate. WILLIAM B. COLEY.]

In the choice of procedures much must be left to the judgment of the operator himself. If he is a surgeon possessing the requisite technical skill, and the patient's condition does not contra-indicate a prolonged operation, it is probable that primary resection will give the better result. This is especially true if the amount of intestine is small.

Primary resection and suture favored in gangrenous hernia. Lockwood (*Annals of Surg.*, Dec., '90).

Primary resection and suture regarded as the ideal operation in gangrenous hernia. Ransohoff (*Jour. of the Amer. Med. Assoc.*, Aug. 13, 20, '92).

One hundred and sixty-eight cases of gangrenous intestine in strangulated hernia collected in which either resection of the gut or the establishment of an artificial anus was adopted. From these it would appear that the results of the former course (a mortality of 47.1 per cent.) are far more favorable than those of the latter (76.6 per cent.). Mikulicz (*Schmidt's Jahrbücher*, May, '92).

Two hundred and eighty-nine resections for gangrenous herniæ compared with two hundred and eighty-seven cases in which an artificial anus was established. The mortality in the former

group is $49\frac{13}{100}$ per cent.; in the latter, $74\frac{22}{100}$ per cent., or 25 per cent. greater. In analyzing the causes of death, the advantage is, in each instance, in favor of primary resection. Diffuse peritonitis and profound collapse regarded as almost the only contra-indications to resection. Zeidler (*Centralb. f. Chir.*, Jan. 21, '93).

Literature of '96-'97-'98.

Case of rapid gangrene of a hernial sac. The patient, aged 48, had a reducible hernia for nine months, and had worn a truss. After a full meal he sneezed and suffered agony, having ruptured the bowel into the sac. An operation performed four hours later showed the sac to be perfectly black. The bowel was simply congested, and a tear $\frac{3}{4}$ inch long was found in it. The gangrene was strictly limited to the sac. There was no strangulation of the sac or contents. Robert Jones (*Brit. Med. Jour.*, Feb. 1, '96).

In patients suffering from prolonged strangulation and who are much prostrated, or when the amount of intestine is very large, it is much safer to leave the gut in place to be dealt with at a subsequent operation. If the operator has had little experience in intestinal surgery, there is no room for debate as to which is the safer procedure. In many cases of femoral hernia the artificial anus has been known to close spontaneously.

[In 382 cases treated from 1822-1858, Frikhoffer found the mortality to be 19.4 per cent. in cases strangulated 1 day or less; 49 per cent. in cases strangulated 2 days. Habs Reichel, in 129 cases operated upon under aseptic conditions, found a mortality of 12.5 per cent. in cases that had been strangulated 1 day; 26.1 per cent. in those that had been strangulated for 2 days. WILLIAM B. COLEY.]

The mortality following operation in strangulated hernia in the leading English hospitals is given as upward of 40 per cent. In 940 cases treated at St. Thomas's, Guy's, and St. Bartholomew's it was 43 per cent. At the London

Hospital it was nearly 50 per cent. Even in recent years the mortality in the four largest hospitals in London is not less than 40 per cent. This high mortality is not ascribed to the operation, but to the time allowed to elapse between strangulation and operation. In cases operated upon during the first twelve hours the mortality is trifling. Bowlby (*Lancet*, May 20, '93).

Literature of '96-'97-'98.

After the first twenty-four hours after operation for strangulated hernia, sips of warm water are given. Should flatus continue until this period, starvation is persisted in until it passes off. If flatus is passed, half a pint of beef-tea is granted during the next twenty-four hours; then, if all goes well, half a pint of milk is added the next day, increased by half a pint daily until two pints of milk and half a pint of beef-tea are reached, generally by the sixth or seventh day. The patient is kept upon this until the bowels act. If by the ninth or tenth day no action of the bowels has taken place, a dose of compound licorice powder is given. The diet is now increased by the addition of fish, then beef-tea, chicken, a chop, and common diet by the end of the second week. Patients are kept in bed for six weeks. Thomas (*Lancet*, Apr. 11, '96).

Accounts of one hundred cases of strangulated hernia in infants under 1 year, all of which were subjected to operation. There were twenty deaths. Death after operation in these cases is almost invariably due to delay. Charles N. Dowd (*Archives of Pediatrics*, Apr., '98).

Indications and Contra-indications for the Radical Operation.—CHILDREN.—The indications for operation may be classed as follows:—

1. Cases of adherent omentum.
2. Cases complicated with reducible hydrocele.
3. Cases irreducible and strangulated.
4. Cases unable to obtain the care and

attention requisite for successful mechanical treatment.

5. Cases over 4 years of age, where mechanical treatment has been faithfully tried for a number of years without benefit.

6. Femoral hernia in children, which, though rare, cannot be cured by trusses.

I believe it is seldom necessary to operate upon children under 4 years of age, and the practice of some surgeons of



Femoral hernia in child aged 7 years.

operating upon infants under 1 year is open to serious question.

Umbilical hernia in children should, with very rare exception, never be operated upon, for the reason that they are almost invariably cured either spontaneously or by means of mechanical support.

ADULTS.—1. In a general way, the younger the patient the better the chances of radical cure.

2. Operation is indicated in all young

adults, inasmuch as there is little prospect of cure by a truss after the age of maturity. The operation in skilled hands is attended with almost no risk and the chances of a cure without the further need of a truss are excellent.

3. All cases of irreducible omentum in patients that are fit subjects for an abdominal operation.

4. All cases of femoral hernia if no contra-indication is present.

CONTRA-INDICATIONS. — Very large irreducible hernia in stout persons should not, as a rule, be operated upon. The risks are large and there is little prospect of permanent cure.

Radical Operation for Inguinal Hernia.

At present the weight of evidence is strongly in favor of the superiority of Bassini's method in operations for inguinal hernia. This method, first performed by its author in 1884, was introduced to the profession in 1890. Bassini published 251 cases with but 1 death and 7 relapses. It is performed in the following manner: The canal being laid open to the internal ring, the sac is separated, drawn down, ligated, and resected. The closed peritoneum is then returned, the spermatic cord is pushed aside, and the posterior margin of Poupart's ligament is exposed. The border of the rectus and the edges of the internal oblique, the transversalis, and the transversalis fascia are then sutured to Poupart's ligament under the cord. The latter is then placed upon the layer of the abdominal wall thus formed, and the border of the external is sutured to Poupart's ligament over the cord, avoiding compression of the latter. A new canal is then formed for the cord. The wound is then closed.

Halsted's method, while it closely resembles that of Bassini, differs in the

Fig. 1



Fig. 2

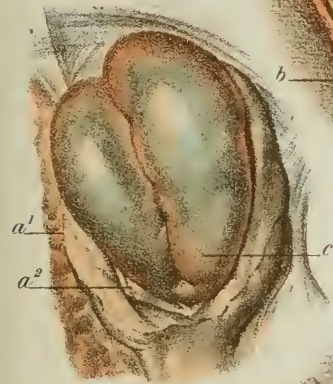


Fig. 3

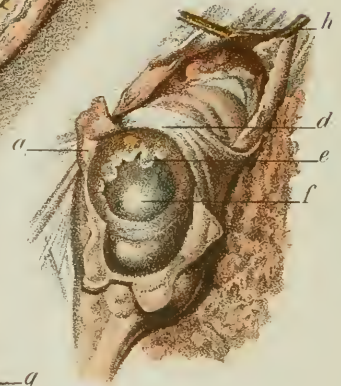
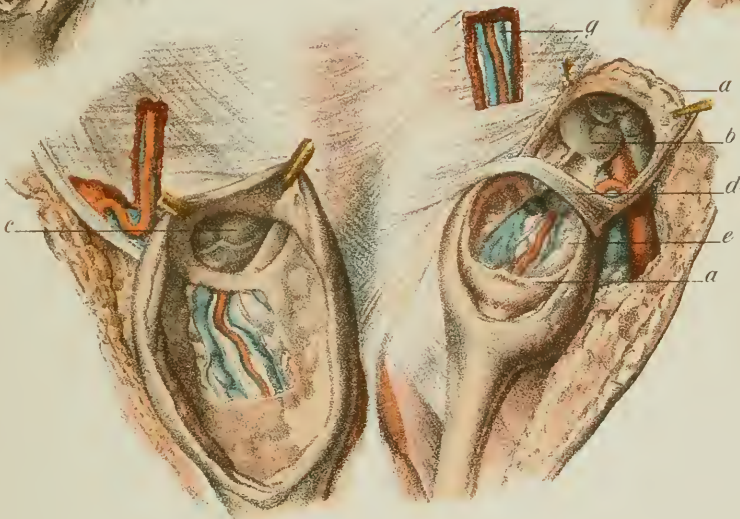


Fig. 4



Dissection of Inguinal Hernia.

Fig 1. *a*. Sac and Overlying Fascia. *b*. Spermatic Cord.

Fig 2. *a*¹ Fascia. *a*² Sac. *c*. Bowel.

Fig 3. *a*. Infundibuliform Fascia overlying the Sac and Sac, *d*. Arched Fibres of External Ring, *e*. Omentum, *f*. Gut, *h*. Fascia of External Oblique

Fig 4. *a*. Sac. *c*. Bowel, *e*. Omentum, *d*. Arched Fibres of External Ring, *g*. Epigastric Vessels.

direction of more complicated technique. The published results, though excellent, are inferior to those of Bassini.

[Halstead, instead of trying to repair the old canal and the internal abdominal ring, makes a new canal and a new ring. The latter should fit the cord as snugly as possible, and the cord should be as small as possible. The skin incision extends from a point about five centimetres above and external to the internal abdominal ring to the spine of the pubes. The subcutaneous tissues are divided so as to expose clearly the aponeurosis of the external oblique muscle and the external abdominal ring. The aponeurosis of the external oblique muscle, the internal oblique and transversalis muscles, and the transversalis fascia are cut through from the external abdominal ring to a point about two centimetres above and external to the internal abdominal ring. The vas deferens and the blood-vessels of the cord are isolated. All but one or two of the veins of the cord are excised. The sac is carefully isolated and opened and its contents replaced. A piece of gauze is usually employed to replace and retain the intestines. With the division of the abdominal muscles and the transversalis fascia the so-called neck of the sac vanishes. There is no longer a constriction of the sac. The sac having been completely isolated and its contents replaced, the peritoneal cavity is closed by a few fine silk mattress-sutures, sometimes by a continuous suture. The sac is cut away close to the sutures. The cord in its reduced form is raised on a hook out of the wound to facilitate the introduction of the six or eight deep mattress-sutures which pass through the aponeurosis of the external oblique, and through the internal oblique and transversalis muscles and transversalis fascia on the one side, and through the transversalis fascia and Poupart's ligament and fibres of the aponeurosis of the external oblique muscle on the other. The two outermost of these deep mattress-sutures pass through muscular tissues and the same tissues on both sides of the wound. They are the most important stitches,

for the transplanted cord passes out between them. If placed too close together the circulation of the cord might be imperiled, and if too far apart the hernia might recur. The precise point out to which the cord is transplanted depends upon the condition of the muscles at the internal abdominal ring. If in this situation they are thick and firm, and present broad, raw surfaces, the cord may be brought out here. But if the muscles are attenuated at this point, and present thin, cut edges, the cord is transplanted farther out. The skin-wound is brought together by buried skin-sutures of very fine silk. He uses an uninterrupted buried skin-suture without knots, which



Double inguinal hernia (inoperable).

is withdrawn after two or three weeks. The transplanted cord lies on the aponeurosis of the external oblique muscle and is covered by skin only.]

The Bassini and Halsted methods have given such satisfactory results, with so small a mortality, that the writer believes that simple reducible hernia should be included among the indications for operation. J. B. Deaver (*Amer. Jour. of the Med. Sciences*, June, '95).

Literature of '96-'97-'98.

Two hundred and fifty Bassini operations for the cure of inguinal hernia without mortality. These operations

were done upon 216 patients, 34 having been operated upon on both sides. Fifty-two of the cases were females and 164 were males. The ages of the patients varied from 5 months to over 80 years. Fifty-five of the operations were on patients under 14, 16 of them were patients over 60, and 2 were on patients over 80. The cases operated upon in the extremes of life were those of irreducible or strangulated hernia. W. B. de Garmo (Va. Med. Semino., June 25, '97).

The brilliant results of Macewen have not been generally obtained by other surgeons, while the transperitoneal method very recently introduced by Dr. George R. Fowler, which may be, in some respects, preferable to other methods, is as yet too recent to warrant passing judgment upon.

In radical operation for hernia six weeks in bed and two weeks more of abstinence from physical exertion should be the minimum period allowed. Kocher (Corr. f. Schweizer Aerzte, Sept. 15, '92).

Literature of '96-'97-'98.

In any operation aiming at radical cure it is necessary to support and strengthen fascia transversalis. The most frequent cause of recurrence after some of the recent operations is owed to neglect of this point. Heuston (Brit. Med. Jour., Apr. 18, '96).

A method has been employed in about 60 cases by Bull and Coley during the past six years, which they have named "suture of the canal without transplantation of the cord," the other steps being identical with Bassini's operation. The results, thus far, have been nearly, if not quite, as good as in Bassini's, though the number is as yet too small to estimate its comparative value; its only advantage lies in the direction of greater simplicity in the technique.

All methods in which the sac is allowed to remain behind to be disposed of in various ways should be abandoned. If

the sac is left behind there is less chance of securing primary union, and it affords no additional security against relapse.

Results of Operation.

It must now be admitted that hernia can, for a considerable time at least, be cured by operation. Whether these cures will prove permanent cannot, as yet, be stated positively, for a permanent cure, strictly speaking, would mean freedom from relapse until the death of the patient. Although no definite time-limit can be laid down beyond which relapse may not occur, nevertheless a careful study of cases operated upon up to the present time enables us to arrive at certain fairly-definite conclusions.

There were 360 cases of relapsed hernia following various methods observed at the Hospital for Ruptured and Crippled. An analysis of these cases throws much valuable light upon the question as to when relapse is most likely to occur. In 80 per cent. relapse occurred during the first year after operation; 64.5 per cent. during the first 6 months after operation; 11.9 per cent. occurred after a period of 2 years; 5 occurred from 10 to 22 years after operation. There were 31 femoral cases and 329 inguinal. Bull and Coley (Annals of Surgery, Nov., '98).

In view of these facts it may be stated in a general way that, if a rupture is sound at the end of one year after operation, there is a strong probability of permanent cure, while, if it remains well for two years, the chances of relapse are very small. Ninety-five per cent. is a conservative estimate of cures following Bassini's operation if the operation has been properly performed. This estimate presupposes a judicious selection of cases.

[Some operators openly state that they never select their cases. There is no field in surgery, I believe, in which there is greater need for the exercise of good judgment than in that of opera-

tions for the radical cure of hernia.
WILLIAM B. COLEY.]

The practice of operating upon all cases of hernia, irrespective of the age of the patient and the size of the hernia, cannot be too strongly condemned.

Roux, of Lausanne, Switzerland (personal communication), has operated upon 1398 cases, with 5 deaths.

[Results of 1042 operations for radical cure performed since 1888 by Bull and Coley; 522 by Dr. Bull, including 66 children, and 531 by myself, including 365 children. Of Dr. Bull's cases, 134 were operated prior to 1890 by the Czerny and Socin methods, and show the great superiority of the Bassini method.

Out of the 134 cases operated upon prior to 1890, only 49 healed by primary union; 40 per cent. relapsed within two years after operation, and most of these relapses occurred during the first year after operation.

It should be noted that of the 134 cases only 16 were in children under 14 years of age.

In regard to the suture material, silk was used in 12 cases, and in every case traced a sinus developed after a longer or shorter interval after operation, remaining open until one or more sutures were finally discharged or removed. The silk was prepared by boiling in a 5-per-cent. carbolic-acid solution just before using it.

The mortality (3 deaths) was considerably higher than that in the later cases. Death was caused in 1 case by ligature of the omentum too close to its attachment to the bowel; 1 died of hæmorrhage and 1 of peritonitis.

Of the total number of cases,—1053,—924 were inguinal, 94 femoral, 19 umbilical, and 15 ventral; 100 of the cases were females, 461 were children between 4 and 14 years of age, and 592 over 14 years.

Bassini's method was employed in 618 cases, with 12 relapses. Of these cases 371 were children under 14 years of age, with 3 relapses, or $\frac{3}{4}$ of 1 per cent.; 247 adults over 14 years, with 9 relapses, or 3.7 per cent. In the 60 cases in which

the cord was not transplanted, but in which the other steps of the technique were the same as in Bassini's method, there were 4 relapses. Of Dr. Bull's cases, 170 were operated upon by Bassini's method, and of Dr. Coley's cases, 448 were operated upon by Bassini's method.

Broca, of Paris, has operated upon 1064 cases by his own method, with 9 deaths; a large proportion of these cases were children. The number of cases traced is not stated. Halsted has operated upon 309 cases with 1 death. In 205 operated upon by his own method, there were 12 relapses. Macewen has operated upon 224 by his own method, with 2 deaths. Of this number 107 were traced with 15 relapses and 93 cases well from two to ten years after operation. WILLIAM B. COLEY.]

Analysis of 133 cases of hernia operated upon for radical cure with no mortality, and, as far as traced (78 cases), only 6 relapses. One-third of the entire number had been under observation ten years. The writer attempts to reconstruct the canal, and uses buried sutures of kangaroo-tendon, to which he attributes, in great measure, his very excellent results. Marcy (*Lancet*, Aug. 19, '93).

There were 477 operations for radical cure in children under the age of 15 years,—14 for umbilical hernia, 41 for inguinal hernia in girls, and 395 for inguinal hernia in boys. Of all these cases, a single one, a boy, died from septic peritonitis. Although strangulation, which is not common in very young children, yields readily to taxis, as a rule, operation should nevertheless be performed, especially when associated with ectopia. Of 250 cases seen after six months, only 3 had had a relapse; 2 of these had again been operated on and definitely cured. Several of the children had had whooping-cough after the operation. Broca (*Nouv. Arch. d'Obstet. et de Gynec.*, Aug., '95).

Literature of '96-'97-'98.

Report of 324 cases which, with but one exception, were traced beyond two years. Two hundred and seventy cases

remained cured, while 54, or 16.7 per cent., were found to have relapses. There were 288 cases of inguinal hernia; of these 48, or 16.7 per cent., relapsed. Of 22 cases of femoral hernia, 6 relapsed, or 27.3 per cent. Fourteen cases of umbilical hernia showed no relapses, but are all presented as cures. Another series of cases were operated upon between 1890 and the middle of 1894. Analysis of these showed that the percentage of final cures bears a direct proportion to the age of the patient. The younger the patient, the better the result. The cases over 40 years of age show six times as many relapses as those under 10.

Two hundred and thirty-five cases were operated on by the method of Ferraro slightly modified: free dissection of the hernial sac and high ligation beyond the neck. The anterior pillars are then sutured with silk without transplantation of the cord: 53 only operated upon by Bassini's method, substituting the purse-string suture for the interrupted sutures employed by Bassini and using silk. Conclusion that the suture of the anterior pillars is by far preferable to Bassini's method. Results also confirmed the opinion held by most surgeons at present, that primary union is of great importance in securing good and permanent results. Roux (*Rev. Med. de la Suisse*, vol. xvii, July, '97).

Cure of hernia cannot be considered radical until a period of two years has elapsed since operation, and even after three, four, or five years there may be recurrence.

Of the three varieties of abdominal hernia commonly encountered the umbilical is most readily cured. The crural is the one in which failure is most frequent. The likelihood of cure is proportionate to the youth of the patient. Taillens (*Revue Méd. de la Suisse Romande*, July 20, '97).

[Barker (*Brit. Med. Jour.*, Sept. 10, '98) reports 200 consecutive operations for the radical cure of hernia: of these 50 were reported in 1890. But 3 deaths in 200 cases, 1 of which was due to ether poisoning. In both of the other fatal cases the hernia was a large, irreducible sigmoid hernia.

In 21 out of 200 cases, sutures came away either while the patient was in the hospital or later at home. (This affords further evidence in support of the opinion frequently expressed by Dr. Bull and me, that non-absorbable sutures not infrequently cause troublesome sinuses.) Own method employed in 79 cases; in 57 Bassini's; in 7 Kocher's; in 2 Macewen's. Bassini's operation, when carefully carried out, regarded as the best operation yet devised.

Statistics of Kocher's operations (*Deutsche Zeit. f. Chir.*, B. 48, H. 5, G. S. 538, '98) for radical cure of hernia. Since 1893 he has operated upon 163 patients, with 197 herniæ. Of these, 148 were inguinal, 17 femoral, 18 umbilical, ventral, and epigastric. The youngest was 1 year, and the oldest 71 years. Of inguinal 26 were under 1 year; 78, 1 to 10 years; 38 over 10 years. WILLIAM B. COLEY.]

Dangers and Complications Associated with the Radical Operation.

The chief dangers to be guarded against are pneumonia and wound-infection. Prior to 1890 in the larger proportion of fatal cases death was due to wound-infection; but at present, with the gradual perfection of technique, I consider pneumonia from the anæsthetic the greater source of danger. The mortality has been gradually reduced from about 6 per cent., in cases prior to 1890, to less than 1 per cent. in cases operated upon during the last decade. Dr. Bull and I have collected 8000 cases operated upon since 1890, showing a mortality of less than 1 per cent.

PRECAUTIONS.—The greatest care should be exercised in cleansing the skin of the patient, as well as the hands of the surgeon and assistants.

Some form of absorbable material, sufficiently durable to permit of tendinous union, should be used for all the buried sutures. Kangaroo-tendon, on account of its strength and pliability,

may be regarded as superior to chromicized catgut. Catgut, if properly chromicized, may be nearly as good, but, as usually prepared, it is more harsh than the tendon and is more likely to cause irritation and subsequent production of a sinus, as is so frequently the case with non-absorbable suture-material. My objections to non-absorbable sutures, including silk, silk-worm gut, and silver wire (formulated by me in 1895) were based upon the observation of 16 cases in which the use of sutures was followed by the formation of sinuses and extrusion of sutures. These sinuses often required many months to heal, and the prolonged suppuration so weakened the canal that in most cases relapse followed. This opinion has been further confirmed by more recent observations of Dr. Bull and me, 26 cases having been personally observed.

Fine catgut is employed for the ligation of the arteries and for closing the skin. Catgut is prepared by boiling it in absolute alcohol under a temperature of 210° . Both catgut and tendon that I have employed during the past seven years have been prepared by Van Horn & Co., of New York. Bacteriological tests have invariably proved the suture-material sterile.

COMPLICATIONS.—Orchitis occasionally follows operation, especially if the herniæ have been of the congenital type and of large size. The application of an ice-bag for a few days always relieves this condition. In adult cases it is of great advantage, immediately after operation, to apply a strip of rubber plaster, about two inches wide, across the thighs in such a way as to form a support for the testes. It prevents any dragging on the cord and adds much to the comfort of the patient.

Injury to the Cord.—If the operation

is performed with due care, there is no danger of injuring the cord, even in children. If the bleeding vessels are at once caught and tied, the wound kept clean, the different layers of tissue can be recognized as easily as in a dissection on the cadaver. Bassini's operation cannot be properly performed unless this be done.

Atrophy of the Testis.—When Bassini's operation was first introduced, atrophy of the testis was regarded as a possible danger, and this deterred some surgeons from employing the method. Not a single case of atrophy of the testis has been observed by Dr. Bull and me in over 650 of Bassini operations. Cases of atrophy have been occasionally observed after Halsted's operation, by Dr. Halsted himself, as well as by other surgeons. O'Connor very recently reported 20 per cent. of atrophy of the testis in 129 cases operated upon by Halsted's method.

Inguinal Hernia in the Female.

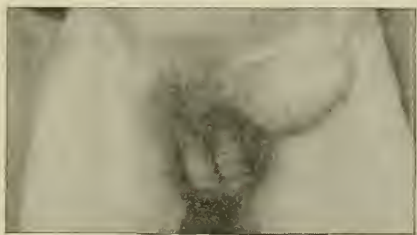
The operative treatment of inguinal hernia in the female has received but little attention from most surgeons. Championnière was the first to urge it. His method was to excise the round ligament with the sac; but this we believe to be entirely unnecessary and not without objection. The method we have employed has been practically Bassini's method for the male, with the single step of the transplanting of the cord omitted. The incision through the aponeurosis is the same; the same tissues are included in the deep layer of sutures. The round ligament can, in all cases, be freed from the sac, and when this has been done and the sac has been dissected high up beyond the internal ring, it is ligated and excised; the ligament is allowed to drop back into its original place and the tissues are sutured over it. In the deep layer interrupted sutures of

kangaroo-tendon are employed, and in the aponeurosis a continuous suture of the same material.

[Including adults, Dr. Bull and I have operated upon 100 cases of inguinal hernia in the female. Of these 53 were adults and 47 children. Of the adults, 23 were well upward of 2 years; 15 from 1 to 2 years; 5 not traced; 8 operated on less than 1 year. Of children, 17 were well upward of 2 years; 26 were well over 1 year. Total female adults and children, 60 cases were well over 1 year; 40 cases were well over 2 years. WILLIAM B. COLEY.]

Femoral Hernia.

In this variety of hernia the bowel protrudes through the femoral ring underneath Poupart's ligament. It pene-



Femoral hernia.

trates the crural femoral or crural canal, the small space extending from the femoral ring to the saphenous opening of the fascia lata. On its inner side is Gimbernat's ligament; on the outer the femoral vein and its floor, as found by the pubes, covered by the pectineus muscle. The peritoneal sac of a femoral hernia is always acquired. When it advances beyond the saphenous opening it usually becomes much larger. The hernia proper is formed by the skin, the superficial fascia, the cribriform fascia, the sheath of the vessels, the septum crurale, and the peritoneum. Its neck is at the femoral ring, where constriction occurs from the edge of Gimbernat's lig-

ament. Although generally small, it occasionally attains large proportions. Besides intestine, the omentum is often found in the hernial cavity.

Femoral hernia seldom occurs before puberty, and is much more common in women than in men.

DIAGNOSIS.—When a femoral hernia is not strangulated, an impulse may be felt when the patient coughs. The tumor is generally tense, small, and round, and can be pushed to the outside of the spine of the pubes.

Inguinal Hernia.—From this variety the distinction is sometimes difficult, especially in women; but the neck of a femoral hernia is always *below* the spine of the pubes and to the outer side.

Enlarged Lymphatic Glands.—These possess no neck, and several glands more or less enlarged can often be felt. Gurgling cannot be detected; fluctuation through the presence of pus sometimes renders the diagnosis difficult.

Psoas-abscess.—Gurgling is also absent, but cough also causes an impulse, and the abscess often disappears as in hernia when the recumbent position is assumed. Spinal symptoms usually complicate such cases, however. If a psoas-abscess, deep pressure in the iliac fossa will detect the tumor after apparent reduction.

Varix of the femoral vein is sometimes misleading, but pressure over it from below upward, sliding the finger over the vein until the femoral ring is reached, causes it to become emptied, but it may be seen to quickly refill from below,—the differential feature.

Cysts are reducible, but coughing produces no impulse.

Lipomata are bosselated, have no impulse on coughing, and are more doughy to the touch.

Hydrocele and a thickened empty sac are

difficult to differentiate, and sometimes require an exploratory incision.

Treatment of Femoral Hernia.—REDUCIBLE.—An appropriate truss involving the principles as to pressure, etc., already outlined, should be employed. A truss is not curative in the case of femoral hernia, however, and is often held in place with considerable difficulty. It should press diagonally upward toward the spine. Compression of the femoral vein, which lies externally to the hernia, must be avoided.

STRANGULATED.—A strangulated femoral hernia may sometimes be reduced by taxis when the thigh is flexed and rotated inward, which position causes the saphenous opening to be relaxed peripherally. No excessive compression or upward pressure should be exercised, however, operation being less hazardous than such a proceeding.

Radical Operation for Femoral Hernia.—Until very recently femoral hernia has been regarded as less amenable to radical cure than inguinal; but the statistics would tend to disprove the correctness of this idea.

[There are, as yet, few statistics from which to estimate the value of operation for femoral hernia. I have collected 221 cases, exclusive of 91 operated upon by Dr. Bull and me, with 3 deaths. Bassini operated upon 54 cases with no deaths and no relapses in 41 which were traced from 1 to 9 years. Küster operated upon 34 cases with no relapses; Kocher reports 18 cases with no relapses. I personally have operated upon 36 cases, with 1 relapse. This was the only case in which I failed to secure primary union. WILLIAM B. COLEY.]

Numerous methods have been from time to time brought out; many of them are complicated and the majority of them have been supported by a very small number of cases. The inguinal method for the cure of femoral hernia, in which

the opening is made in the inguinal canal and the femoral opening closed within the abdominal cavity, has been employed by a number of surgeons. It is, I believe, unnecessarily complicated, and, as long as almost perfect results can be obtained by the simpler methods, I think it should have no place in surgery. There is the additional risk not only of having a recurrence in the femoral region, but through the opening made in the inguinal canal. Various osteoplastic operations have been introduced by means of which the femoral opening is closed by a bony flap. Most cases of femoral hernia, I believe, can be cured by one of the two following methods: 1. Pulse-string suture of kangaroo-tendon. This suture is introduced first through Poupart's ligament, the outer part of which forms the roof of the crural canal, then passes through the pectineal fascia, the fascia over the femoral vessels, and lastly upward through Poupart's ligament, emerging about $\frac{1}{4}$ inch from the point of entrance. When this suture is tied it brings the floor of the canal into contact with the roof and completely closes the opening. It is very important to thoroughly free the sac before applying the ligature. I have employed this method in 25 cases with not a single relapse, and 10 cases were traced from 2 to 6 years. This method I believe sufficient for femoral hernia in children and the great majority of adults.

If the opening is very large Bassini's method, which has given such admirable results for femoral hernia, may be employed.

An incision is made parallel with Poupart's ligament and over the centre of the tumor. This is the same incision that I employ in the purse-string suture. The sac is dissected free from the canal and ligated as high up as possible; with

a curved needle six or seven sutures are inserted so as to unite Poupart's ligament with the pectineal fascia, thus accomplishing the same object that the purse-string suture does. The first suture is placed near the spine of the pubis; the second half a centimetre externally; the third one centimetre from the femoral vein, and the remaining sutures are so placed as to bring together the anterior and posterior walls of the canal.

Umbilical Hernia.

VARIETIES.—Three forms of umbilical hernia are usually recognized: the



Large umbilical hernia in infant.

congenital, due to faulty union of the visceral plates in the middle line; the *infantile*, which occurs soon after birth as a result of yielding of the umbilical cicatrix after separation of the umbilical cord; and the *adult*, which usually presents itself late in life in women who have borne many children.

CONGENITAL UMBILICAL HERNIA.—In this variety the contents can often be seen through the hernial coverings, owing to the thinness of the layers. The hernia, though usually very small, is sometimes quite large from the first, and

contains the greater part of the abdominal organs.

Child, twenty-four hours old, with a congenital umbilical hernia containing the whole of the liver. Operation. One year later the child was in good health and had no hernia. C. L. Scudder (Boston Med. and Surg. Jour., Jan. 4, '94).

Strangulation may occur at the neck through compression of the surrounding tissues, but it has also been caused traumatically by means of the cord applied around the funis at birth, leading to a fatal issue if much intestine is involved. A fæcal fistula results if but a small portion of gut is lost.

Treatment.—Immediate reduction should be practiced if possible, and retention of intestine insured by the application of adhesive strips over a small pad placed over the opening. Many surgeons advise the immediate closure of the edges of the ring by catgut sutures. The operation is simple and effective.

Successful operation performed for the relief of a defective closure of the umbilical opening in a female child 1 day old. The liver, several loops of intestine, and some ascitic liquid were contained in the protrusion, the walls of which were exceedingly thin. Chloroform was used. The operation was a very simple one, and by the fifteenth day union was complete. Salmon (Gaz. des Hôp., p. 1219, '92).

There were 13 cases of congenital umbilical hernia collected, 10 of which were treated by laparotomy, freshening the edges of the hernial opening, and suture under antiseptic precautions; 3 were treated by the expectant method. Of the 10 treated by surgical procedure, 7 recovered and 3 died. Of 3 treated by expectant plan, 2 died. Operative treatment may be instituted as early as the second day of life with success. Lindfors (Amer. Jour. Med. Sci., Oct., '89).

INFANTILE UMBILICAL HERNIA.—This form of hernia, though freely met with, never leads to strangulation, and

quickly subsides by contraction of the opening if, after reduction, appropriate retentive measures are resorted to.

Treatment.—The hernia should be reduced, then held in place by means of a cork pad wrapped in cotton wadding, held in *situ* by adhesive strips. When these irritate the skin, or the hernia seems rebellious, a light truss can be utilized instead.

Literature of '96-'97-'98.

In umbilical hernia during the first months of life no operation is necessary, for, as a rule, the hernia is reduced by contraction, tightening, and obliteration of the umbilical ring. In older children it is important to insure the reduction of the tumor, as hernia developed in such children does not tend to spontaneous recovery. After 7 years of age operation is the only likely method of cure. Sébileau (Sem. Méd., Jan., '97).

ADULT UMBILICAL HERNIA.—This variety of hernia protrudes through the linea alba, not far from the umbilicus, and is generally observed in stout people, especially in women.

Umbilical hernia in the adult may attain enormous proportions, hanging down like a large pouch if allowed to go untreated. The omentum, transverse colon, and small intestines may all be found in it.

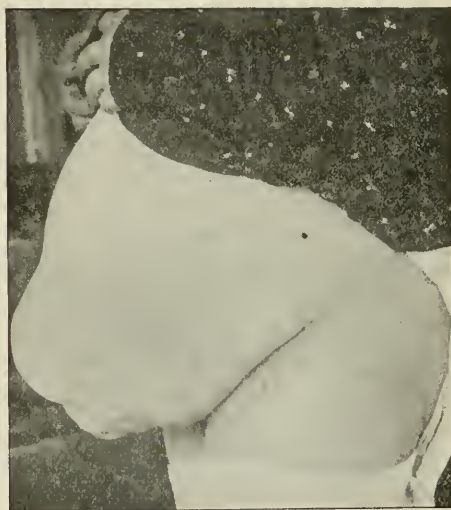
Treatment. — When reducible, the hernia is held with difficulty by trusses, especially in large subjects. A broad belt with a pad fastened to it is sometimes more effectual. It is frequently irreducible, however, and is prone to inflammatory manifestations. When it cannot be reduced, it is best to protect it by means of a cup-shaped pad held in position by a bandage or a belt.

This variety of hernia is also liable to become obstructed, a complication occasionally leading to strangulation. There

is local disturbance and sometimes pain; vomiting sets in and the other manifestations of strangulation already described present themselves.

Taxis should be tried and, if care be taken to empty the hernial intestines of all gas by gentle pressure, often succeeds. If it should not, however, the proclivity of the hernia to rapidly become gangrenous, owing to compression of its vascular supply, renders an immediate herniotomy advisable.

When operation becomes necessary,



Large umbilical hernia.

the skin should be divided over the orifice, remembering that the sac is exceedingly thin and that it may readily be penetrated. Adhesive inflammation often causes the contents to be adherent, another complicating circumstance. To overcome the constriction without opening the peritoneum should be the first aim; if this is impossible, a couple of shallow incisions through the fibrous ring at its lower border from the inside of the sac will generally make it possible to reduce the strangulated loop. The

adherent omentum should then be liberated, ligated, and removed, and its stump returned. After freshening the pillars of the ring and suturing, the wound should be closed and drained. Should the gut be gangrenous an artificial anus is the only resort.

Ventral Hernia.—"Ventral" is a general term applied to herniæ occurring in parts of the abdomen other than the umbilicus, especially those following operative procedures, such as laparotomy. It may also result from abscess of the abdominal wall, defective development, muscular rupture, etc. Strangulation is rarely witnessed, owing to the nature of the orifice. Its treatment is that recommended for umbilical hernia.

The results of operation for the radical cure of umbilical and ventral hernia have been more or less disappointing.

[Dr. Bull and I have operated upon 34 cases of umbilical and ventral hernia; of these 15 were ventral, including 3 epigastric and 11 hernia following laparotomy; 4 following appendicitis operations in which the wound had been left open. In the total number of cases of umbilical and ventral hernia there were 12 relapses out of 21 cases traced; 9 relapsed during the first year; 3 of the umbilical were strangulated, with 2 recoveries. WILLIAM B. COLEY.]

The large percentage of relapses occurring in umbilical hernia is explained by the fact that these cases are mostly very unfavorable for radical cure. They are stout women in middle age with a great abundance of fat and very little muscular tissue in the abdominal wall.

EPIGASTRIC HERNIA.—This is a general term applied to forms of hernia occupying the space between the end of the sternum and the umbilicus. These tumors are sometimes discerned with difficulty and are apt to cause symptoms usually referred to gastric disorders.

In young persons suffering from gastric disorders a careful examination sometimes reveals the presence of small tumors, no larger than a hazel-nut, in the linea alba, between the ensiform appendix and umbilicus, at the site of an *inscriptio tendinæ* in the rectus. These hernial protrusions usually contain omentum, and, as the sac cannot readily be felt, the tumors may be mistaken for lipomata of the abdominal walls. They give rise to severe pains and vomiting. The radical operation for hernia causes a complete disappearance of the disturbances. Von Bergmann (*Wiener med. Woch.*, No. 5, '91).

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Especial attention called to hernia in the linea alba. These are often very small, varying in size from a pea to a walnut, usually above the navel, may be multiple, and occur generally in men from 20 to 50 years. All the author's twelve cases were among the working-classes. They are most apt to contain only subperitoneal fat, but may consist of omentum or intestine. The symptoms are the same in any case. These are very various. There may be no disturbance at all, or the symptoms may come on suddenly and be more severe. In the typical case there is colicky pain, increased by pressure, radiating toward the shoulder or giving the girdle-sensation; there are generally recurring attacks of pain and vomiting. Kuttner (*Mitteilungen aus der Grenzgebieten der Med. und Chir.*, vol. i, No. 5, '97).

Epigastric hernia should include all herniæ which are found in the area bounded above by the xyphoid cartilage, below by the umbilicus, and on the sides by the cartilages of the ribs. They so commonly appear in the linea alba in comparison with other sites that they have been termed "hernia in the linea alba." In a series of 16,800 cases of all varieties of hernia examined by Berger there were 137 cases of epigastric hernia, some of the cases occurring alone, some in combination with other forms of hernia. It is very exceptional to find these cases in subjects less than 18 years of age, and most of the subjects of such a

form of hernia are between 25 and 50. Astley Cooper, however, reported 2 congenital cases, and some few cases have been reported as beginning in early childhood. The vast majority of cases are in males of the working class. As a rule, the onset is insidious. The patient complains for some time of stomach-symptoms before the hernia appears externally or when the hernia is so small as to escape detection without a careful examination. In not a few cases, however, there has been a traumatism, followed by very acute local and general symptoms, and the tumor has appeared within a few hours. Lothrop (Boston Med. and Surg. Jour., Feb. 25, '97).

The size of the hernia and the consequent disability are of much interest, the herniæ ranging in size between that of an egg and a child's head. The weakness and discomfort caused by these herniæ are very much the same as in hernia following laparotomy.

Observation of 1000 cases of laparotomy done in the hospitals in Berlin, showing that nearly one-third of all the cases suffer from ventral hernia. In some cases the hernia does not develop for one or two years after the operation. Winter (La Semaine Méd., June 15, '95).

In regard to the treatment of such cases, much depends on the age of the patient, as well as upon the character of the abdominal wall. As a rule, these patients are young adults with good abdominal muscles, little accumulation of fat, conditions the contrary of which is usually found in umbilical hernia and which so often contra-indicate operation.

The results of operations for epigastric hernia are very satisfactory. The same is true of cases following appendicitis. Of four cases not one relapsed, though the herniæ were of large size and adhesions were present.

Cæcal Hernia.—This form of hernia is far more frequent than is generally supposed. I have observed it 16 times in

531 operations. In a number of cases the cæcum could be reduced, but the appendix could not, on account of adhesions to the sac. Cæcal hernia occurs usually on the right side, but may be found on the left. I have operated upon one left inguinal hernia in which the sac contained a large, vermiform appendix. The patient was 10 years old. In the majority of cases, especially in young subjects, the hernia is congenital.

Strangulated hernia of the cæcum in any form is infrequent, the number of cases met with in a large series of 565 herniotomies amounting to only 1.59 per cent. Extreme rareness of uncomplicated cases of this form of strangulated hernia noted, two instances only being found in this same series. The very high rate of mortality (66.6 per cent.) was clearly due to the critical condition of the majority of the patients at the time of operation. Bennett (Lancet, Feb. 1, '90).

Rare Forms of Hernia.—**DIAPHRAGMATIC HERNIA.**—This form may be *congenital* or *acquired*. The congenital form is due to imperfect closure of the diaphragm and the protrusion into the pleural cavity of a portion of the abdominal contents. This occurs by the side of the ensiform cartilage, between the xiphoid and costal portions. A diagnosis of this condition is hardly obtainable.

Case of diaphragmatic hernia in male child, 3½ years of age, showing the following points of interest: 1. The physical signs in this case were identical with those of empyema. 2. The frequent high temperatures, for which there was no apparent cause except constipation. Lynde (Archives of Pediatrics, Dec., '89).

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Case of congenital diaphragmatic hernia diagnosed during life. The patient was 14 months old. Percussion was dull on the left side of the chest and vesicular murmur was absent; posteriorly on the left side interstitial gurgling could be heard at times. When the child was

inverted the lower part of the left chest became tympanitic and the note on percussion varied between tympanitic and dull, with variations in positions at different times. In consequence of the development of vomiting, constipation, and collapse it was thought that some strangulation had possibly occurred and abdominal section was performed. All the intestines were found in the left chest, but were not strangulated. The child died. There was a semicircular deficiency in the posterior part of the left leaflet of the diaphragm 2 inches long. The spleen was in the left pleural cavity; the left lung was completely undeveloped. The peritoneum was continuous with the pleura round the opening. Jeffreys Wood (Lancet, Apr. 16, '98).

The acquired form may be due to rupture of the diaphragm through violent effort, direct violence, or penetrating wounds. The penetration through the opening thus formed suddenly creates dyspnoea and asphyxia, besides other manifestations which the displacement of organs give rise to according to the site of the tear or laceration in the diaphragm. Excessive thirst has been noted by Bryant as a prominent symptom.

Case of diaphragmatic hernia in which the author performed laparotomy. Nearly the whole sigmoid flexure and the large omentum had disappeared through the diaphragm. All the efforts to effect a replacement were useless, either through the stomach turning on its axis or the sigmoid flexure. The patient died the day after the operation. G. Naumann (Hygeia, Aug. 8, '88).

Autopsy performed upon a man, aged 67 years, who had been for nineteen years subject to colic and dyspnoea, the first attack having followed a violent fit of vomiting. He died after an illness of five or six days, with vomiting and obstinate constipation. Through an opening in the diaphragm extending from the mediastinum five inches to the right, the caput coli, a loop of transverse and descending colon, and a mass of omentum had passed: the loop of colon was distended with gas and highly inflamed.

The appendix vermiformis was seven inches long and one-fourth inch in diameter. Currier (Med. and Surg. Rep., Mar. 5, '92).

PROPERITONEAL, OR INTERSTITIAL, HERNIA.—There are three varieties of interstitial hernia classified according to the relative position of the sac:—

1. In which the sac lies between the peritoneum and the transversalis fascia. This variety is very rare. A tumor is seldom present, and the condition is not often recognized until strangulation has occurred.

2. In which the sac lies between the external and internal oblique muscles.

3. In which the sac is external to the aponeurosis of the external oblique.

In the last two varieties there is a well-marked tumor which is situated in the inguinal region, but seldom extends into the scrotum. While the mode of formation in many cases is difficult to explain, in most cases the condition is associated and probably dependent upon undescended or partially descended testis. In the rare cases of this variety of hernia observed in women it has been associated with a hydrocele of the canal of Nück; the undescended testis or the hydrocele, furnishing an obstruction to the further progress of the hernia in the downward direction, causes it to enlarge upward, and, following the line of least resistance, the sac may find its way to the situations already described.

The conditions which may simulate this form of hernia are: a cold abscess from spinal or pelvic bone disease, or hydrocele of the cord. The only form of treatment to be recommended is operative interference.

LUMBAR HERNIA.—This rare form of hernia emerges in the region of Petit's triangle, after passing through the lumbar fascia near the quadratus lumborum,

and may result from strains, wounds, abscesses, or may appear spontaneously, especially in people of advanced age. It is easily reduced and retained by an appropriate belt.

Record of 29 cases of lumbar hernia. The small triangular space bounded by the external oblique and latissimus dorsi muscles and the crest of the ilium (Petit's triangle), it is generally assumed, constitutes a relatively weak spot in the abdominal wall, and that hernial protrusion may occur here, but that strangulation of the contained intestine is very unlikely to develop. Out of the 29 cases 16 developed spontaneously, or were attributed to strain, and all were in adults or elderly subjects. Males and females appear to be equally liable to lumbar hernia. Seven cases of apparently spontaneous origin were on the left side, 4 on the right. In 6 cases (about 20 per cent.) the hernia followed in the track of a previous abscess or sinus—4 in males and 2 in females. In 5 cases the hernia was due to wound or other severe traumatism of the loin, and 2 were reported as congenital. A well-made abdominal belt is efficient in preventing protrusion. Hutchinson (Brit. Med. Jour., July 13, '89).

HERNIA INTO THE FORAMEN OF WINSLOW.—This variety, though very rare, is of special importance, because it frequently gives rise to intestinal obstruction. It cannot be recognized without abdominal section; but treatment of the intestinal obstruction by enemata sometimes succeeds in bringing about the reduction by causing distension of the gut and traction upon the engaged loop.

In a case of hernia into the foramen of Winslow abdominal section was performed, and the nature of the trouble determined, although reduction could not be effected. Forty-eight hours later, after a large enema, the symptoms subsided and a rapid and complete convalescence set in. A. Neve (Lancet, May 28, '92).

ISCHIATIC HERNIA.—This term is applied to protrusions taking place through

the lesser sciatic notch, those through the greater being called *gluteal*. It may occur on either side, and may be either congenital or acquired. It has been seen more often in females. Its contents may be bowel, ovary, or a diverticulum of the bladder. Incarceration of a portion of bowel along with an ovary has been observed in three cases. Ischiatic hernia is extremely rare (Garré).

In all cases of perineal vagino-labial hernia the hernia issued from the pelvis, out of the perineum, and distended the labium majus. Three varieties distinguished.

In the "anterior" form the sac protrudes between the sphincter vaginae and the erector clitoridis. In the "median" form it bulges between the sphincter vaginae and the deep transversalis perinei. In the "posterior" form the hernia passes between the levator ani and the gluteus maximus. The abdominal orifice of the sac lies in front of or behind the lateral true ligament of the bladder. The best treatment for all forms of perineal hernia in women is a radical operation, which must be performed from the perineal aspect, the sac being exposed by an incision through the vulvar structures. Winckel (Annales de Gynéc. et d'Obstet., Aug., '90).

PERINEAL HERNIA.—In this form the protrusion occurs between the fibres of the levator ani in front of the rectum; it descends behind the bladder in men, and the vagina in women. It occurs oftener in the latter than in the former and often penetrates the labium majus, forming the labial, or pudendal, hernia. A true labial hernia also occurs, the sac descending between the ramus of the ischium and the vagina into the posterior portion of the labium.

It may be mistaken for Bartholinian abscess and labial cyst, but the inflammatory manifestations of the former and the absence of gurgling in the latter generally render a diagnosis easy.

Winckel, who found 6 cases in 5600 patients examined by him, recommends a radical operation through the perineal tissues.

OBTURATOR HERNIA.—This is a rare variety of hernia, which protrudes through the obturator foramen between obturator externus and pectineus, pushing before it the obturator fascia. The femoral artery and vein pass externally and in front of it, the adductor longus forming the opposite wall. The obturator artery and vein may lie to the inner or outer side of the hernia, especially

feature, in addition to the usual signs of strangulated femoral hernia.

Taxis is sometimes successful, especially if the thigh is flexed, adducted, and rotated inward. The muscles and tissues around the hernia are thus relaxed. If this fails, herniotomy should be performed, the nature of the vascular supply and the fact that the constriction is at the neck of the sac—which should be incised by cutting downward—being borne in mind.

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New York.



Labial hernia.

near the neck: anatomical features which should be borne in mind when operative procedures are to be resorted to. It is seldom recognized and may be mistaken for femoral hernia.

Its situation causes it to manifest itself in the majority of cases as an indefinite bulging or fullness of the tissues of the region, and careful palpation sometimes causes gurgling. It is usually met with in spare women past middle age and subsequent to the menopause. Men less frequently suffer from this variety of hernia. It is rarely distinguished before strangulation occurs. Pain down the leg along the obturator nerve is a distinguishing

HERPES.—Gr., ἑρπῶ, to creep.

Definition.—Herpes simplex is an acute, non-contagious, benign disease of the skin, usually dependent upon a neuritis of the nerves supplying the part, and characterized by an eruption of vesicles in groups upon an inflamed, oedematous base.

Herpes simplex may attack any part of the body-surface, but the malady shows a decided preference for two localities. These parts are the facial and genital regions. Because of the usual distinct restrictions of the disease to one or the other of these sites, and the diversity in symptoms that is liable to

be manifested, two varieties of the disorder have been distinguished, and to each has been given a separate title. They are called *herpes facialis* and *herpes genitalis*. While essentially the same in nature, the specific causes apt to produce them, the dissimilarity of their manifestations, and the various diseases with which they are likely to be confounded, make their individual description a matter of necessity.

Herpes simplex appears but rarely in other situations upon the body and still less likely is it to occur in a generalized form. When such does happen, the term "herpes generalis" is applicable.

[Our etiological and pathological knowledge of the affection is still too limited to enable us to demonstrate with absolute certainty that there is always a preceding or accompanying neurosis, but evidence enough is at hand to warrant our accepting this statement as the truth. The almost constant distribution of the lesions in the course of certain nerves points definitely to such a conclusion. WILLIAM FRANCIS ROBINSON.]

Symptoms.—Herpes facialis may occur upon any part of the face or forehead.

Case of herpes affecting simultaneously the ophthalmic and the auriculo-temporal nerves. Vesicles appeared in the area supplied by the left frontal nerve, groups being present over the eyebrow, near the median line, close to the hair, and near the temple. The eyelids were reddened and swelled. Later, vesicles developed upon the left tympanic membrane. Bonnier (*Jour. of Laryn.*, June, '93).

Two instances of herpes ophthalmicus associated with paralysis of the ocular muscles observed. The first case occurred in a man aged 58 years, the third and fourth, sixth, and first divisions of the fifth nerves being involved. In the second case (a man of 79 years of age) there was complete ophthalmoplegia externa, proptosis, and a glaucomatous condition of the eye, with hypæmia.

The first case was benefited by iodide of potassium. Silcock (*Clinical Jour.*, Aug. 8, '94).

The vermilion border of the lips, also of the nose, upper lip, cheeks, and auricles are favorite sites for its appearance. The mucous membranes of the mouth and throat are often implicated. So, too, the disorder may attack the cornea.

Case of stubborn, recurrent, herpetic disease of the conjunctiva and cornea, in conjunction with menstrual disturbance of the menopause cited. The disease took the form of a small loss of corneal tissue, with fatty, uneven edges, and resembled a phlyctenule in appearance. Its summit had undergone ulceration. The eruption differed from that which is characteristic of herpetic disease by its disposition and appearance. Stuelp (*Archiv f. Ophth. [Gräfe]*, B. 40, H. 2, '94).

At the outset a slight tingling or burning is felt in the part about to be attacked. Redness and swelling rapidly follow, and upon this œdematous base a cluster of tiny vesicles soon appears. Usually an areola surrounds the group. The groups vary in number from one to a half-dozen or more, and in size from the surface of a split pea to a silver twenty-five-cent piece. They are round, oval, or irregular in outline, and may be closely set or widely separated. The vesicles are from pin-head to a kernel of wheat or larger in size and number three to a dozen or more in each group. They are fairly firm to the touch and do not readily rupture. Most authors describe a preceding papular stage. This is exceedingly hard to demonstrate, and, if it does exist, is of very short duration. With care in the examination, fluid may be found in the lesions at the moment of their inception.

At the outset each vesicle is filled with clear, transparent serum. This

gradually grows turbid, until by the end of the second or third day, if the lesion be not sooner ruptured, the liquid assumes a milky condition, and examination under the microscope shows an abundance of pus-cells and degenerated epithelium. Where closely set the vesicles may coalesce, forming a flat-topped bleb.

Unless interfered with, the vesicles run their course in from four to ten days, the process then being completed by the formation of a crust which desiccates and falls, leaving a brownish, pigmented spot. This pigmentation gradually disappears without forming a scar or other relic of the disease.

If the vesicle, as usually happens, is broken by picking, rubbing, or scratching, an excoriation results, which, if it does not become infected, is shortly covered with a crust, and the disease then runs its usual course and terminates in the ordinary way. Such crusts are dry and firmly attached. When the excoriations become infected with pus-cocci or are treated with strong caustics, grave ulcers are apt to supervene and disfiguring scars remain.

Hæmorrhage into the vesicle (black herpes) and gangrene sometimes complicate the process.

Subjective sensations are usually slight. The unsightliness of the disease causes the patient more distress than does the pain of the disorder. The tickling, burning, or pricking sensations occurring at the outset may continue for a day or two and then subside, no further distress being experienced. Sometimes, though rarely, more or less itching is complained of, and even pain is occasionally felt.

Herpes of the mouth and throat (canker spots) presents a somewhat different appearance. Owing to the moist,

warm condition of the parts the vesicles cannot develop as such. A round or oval patch, slightly elevated, and covered with a whitish, sodden exudate, is first formed. These spots may be situated upon the upper or under surface of the tongue, the border of the gums, the inner wall of the cheek, the palate, or the tonsil.

Case of chronic recurrent herpes of the oral cavity seen in a man of 38, healthy until his eighteenth year, when, after an attack of typhoid fever, in 1874, the herpetic trouble began to show itself,—at first upon the lips and along the gums, later on the tongue. The eruption lasted from eight days to four weeks. In 1888 and 1889 for nearly a year the patient was free from herpes. After this, however, the attacks recommenced with greater frequency, sometimes immediately following one another. The patient complained of difficulty of breathing through the nose during the attacks. No general symptoms accompanied the attacks; the pharynx and larynx remained free. Salivation was a marked symptom from time to time, and the mucous membrane of the cheeks was attacked.

The immediate cause of the affection seemed to be some involvement of the trigeminus. Flatau (*Deut. med. Woch.*, May 28, '91).

The most frequent site of herpes of the larynx is upon the posterior face of the epiglottis, and in the neighborhood of the arytenoids.

It is characterized anatomically by the evolution in these regions of herpetic vesicles surrounded by an inflammatory zone, and clinically by the symptoms peculiar to herpetic fever, and also by painful dysphonia, rawness of voice, occasionally aphonia, sometimes dyspnoea.

Its invasion is abrupt, its course rapid, prognosis favorable, and cure complete. Relapses sometimes occur.

Rarely it is accompanied by phenomena analogous to those of croup. Brindell (*Rev. de Laryn.*, xvi, p. 233, '95).

Herpes of the mouth, while not always severe, usually occasions considerable distress.

A condition that is known as "herpetic fever" is occasionally met with. The disease usually occurs in endemics and is characterized by languor, vomiting, and chilly sensations, followed by a rigor and then a sudden attack of fever. The fever may run as high as 104° ; the tongue is moist and heavily coated; the throat is sore, and the glands of the neck enlarged. Restlessness and delirium are exhibited at night. On the second day the vesicles appear and are usually confined to the face. Crocker speaks of defervescence being associated in some cases with the herpetic outbreak.

The disease runs its course in about four days, terminating in recovery.

The course of the disease and its occurrence in endemics points to an infectious origin. Cases have been traced to sewer-gas and faulty hygiene.

[Epidemics have been reported by Savage (*Lancet*, Jan. 20, '83) and Seaton (*Clin. Soc. Trans.*, vol. xix, p. 26, '86).
WILLIAM FRANCIS ROBINSON.]

Diagnosis.—Herpes facialis is to be distinguished from ECZEMA by the larger size and greater stability of the vesicles, by their peculiar grouping, the insignificant sensations accompanying the disease, and the rapidity with which the disorder runs its course. There is no weeping, as in eczema, and no successive new formation of vesicles upon the same sites. The resemblance of herpes, when the lesions have broken and crusts have formed, to IMPETIGO is sometimes marked. But in impetigo the crusts have been preceded by a single vesicle, bleb, or pustule. Instead of a group of vesicles, the patches of disease are not distributed in the line of any cutaneous nerve, but are scattered irregularly over the surface, and typical lesions can usually be found upon the hands and also upon the trunk. There

is often a history of contagion. Care must be exercised in not confounding herpetic lesions of the mouth with the mucous patches of syphilis. Many patients, frightened by the knowledge of their exposure to syphilitic infection, point to their frequently recurring canker spots as indubitable proof that they possess the disease. More decisive evidence in the form of scars, alopecia, gunmata, or the peculiar eruptions of syphilis must be searched for and found before confirmation of the subject's fears should be given. Veterans of syphilis are sometimes subject to herpetic troubles of the mouth that give rise to much mental distress on the part of the patient, but which are not in any wise related to the precedent lues.

Herpes occurs at all stages of pneumonia, and is dependent rather upon the peculiar liability of the subject to herpes than upon the nature of the case. Prognosis is better in cases in which the eruption occurs. Talamon (*Rif. Med.*, Mar. 20, '95).

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Buccal herpes must be differentiated from mucous patches. Buccal herpes is much more painful and much more liable to become fissured. It has from the outset a marked milky tint, and long presents in the centre of its polycyclic border a whitish circle, which is the last vestige of the broken-down or ruptured vesicle. The microcyclic contour has a positive value. The specific treatment is injurious. Fournier (*Revue Internat. de Méd. et Chir.*, June 25, '96).

Herpes simplex can be distinguished from herpes zoster by the bilateral distribution of its lesions, the presence of fever, and the lack of nerve-pain.

Herpes Facialis (fever-blister).

Etiology.—Herpes facialis is a common, though not necessary, accompaniment of many fevers and of catarrhal

disorders of the nose, throat, bronchial passages, and lungs. The popular designation "cold sore" is indicative of the frequency with which the complaint occurs in simple coryza. Typhoid and intermittent fevers frequently give rise to it. Herpes simplex is very apt to occur in pneumonia not only upon the face, but upon the genitals and at times in other localities upon the body. At one time it was believed to occur regularly at the crisis in all cases of sthenic pneumonia in which a favorable outcome was likely to occur. Such auspicious prognosis, however, can no longer be maintained.

Disturbances of the digestive tract, especially in children, are prone to produce herpes of the lips. Indigestion, gastritis, gastric ulcer, and enteritis in adults are frequently associated with this form of herpes. It is not unusual in malaria, but is said to be rare in relapsing fever. Herpes of the nose and lips often co-exists with tonsillitis and bronchitis.

Some persons are so extremely susceptible to the disease that merely brushing the face or the lips with a feather will induce it. Many women are affected at each menstrual epoch with labial herpes.

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Five cases of acute pyrexia occurring between the second and fifth days after confinement or abortion, in each of which the febrile attack terminated by an eruption of facial (usually labial) herpes. In each case the attack was ushered in by rigors; the pyrexia was severe, rising to 103° to 104° F., and in each case, after the appearance of the herpes, the patients rapidly recovered. Attention called to the disquieting nature of these symptoms and their liability to be confounded with those of grave septic infection; when strict antiseptic precau-

tions have been taken in the conduct of labor or abortion, and no local condition can be found to account for the subsequent rigor or pyrexia, it may be well to remember that the explanation of these phenomena may sometimes be found in the occurrence of the herpetic disorder described. Lutaud (*Jour. de Méd. de Paris*, July 12, '96).

Toothache as well as dental instrumentation is known to produce the trouble.

Literature of '96-'97-'98.

Herpes facialis may be due to irritation of the trifacial nerve reflexed from some dental affection. George Carpenter (*Pediatrics*, May 1, '96).

Blows upon the head, exposure of the face to alternate hot and cold blasts, or the application of irritating medications to the parts, are fruitful sources of the disorder. Many cases are thought to arise without appreciable cause, and are spoken of as idiopathic, but it is doubtful if such is ever strictly the truth. A careful analysis would, in all likelihood, reveal in each instance the existence of some irritating factor capable of producing the affection.

Pathology.—Owing to the benign nature of the disease, opportunities for studying its pathology are rare, and our knowledge is correspondingly limited.

[To Unna, of Hamburg, is due much that we know. His observations were confined to the study of tissue taken from three living subjects affected with herpes genitalis, and one corpse dead of a febrile disease in which facial herpes was present. WILLIAM FRANCIS ROBINSON.]

Unna found that the process originated in the upper layer of the rete mucosum and was a true coagulation-necrosis. The cells affected were much enlarged and the cell-contents were

greatly changed. The nucleus had disappeared and the protoplasm could not be stained. This was due to the saturation of the cell by fibrinogenous substance from the fluid surrounding the cell-body. The cell retained its normal shape and the prickles remained intact. Beneath the zone of necrotic tissue a layer of flattened and thinned prickle-cells was found that still retained its normal features and the cells their capacity for staining, thus indicating that the elevation of the whole epithelium was a secondary, and not a primary, occurrence. Deeper down in the rete were cells in a necrotic condition. In most of these the nucleus had disappeared, leaving only a cavity, while in some cell-substance had been completely dissolved in the fluid of the blister. The heads of many papillæ projected into the cavity of the lesion and were entirely denuded of epithelium. It would appear, then, that the process consists of two distinct steps, the first consisting of a fibrinous inflammation of the upper prickle-cell layer, converting it into a nuclear, degenerated, necrotic mass, forming later the roof-wall of the vesicle. The second, the loosening of the epidermis as a whole, with the formation of a subepithelial blister, whose contents again undergo coagulation-necrosis. The blood-vessels and lymph-spaces underneath and about the lesion were found markedly dilated, and distinct, though not extensive, migration of leucocytes was evident.

Prognosis.—The disease is a benign disorder running its course, if not irritated, in from four to twelve days. No scarring is produced. Pigmentation follows the desiccation of the vesicles, but this soon disappears. The disease is exceedingly prone to recur,—in many patients with almost periodical regularity.

Treatment.—The treatment of herpes of the face should be of the simplest kind. All irritation should be removed. No picking, scratching, or rubbing should be allowed. The smoker should be made to give up his pipe or cigar, and all forms of tobacco had best be interdicted.

Strong acetic acid, if applied at the outset before the vesicles have formed, will often cut short the attack or greatly lessen its severity. The action of the acid should be checked before whitening of the skin takes place. If the itching and burning are at all severe, lotions of dilute lead-water and opium, zinc oxide and lime-water, elderflower-water, camphor-water, or weak ammonia-water may be used freely. These should be followed by a simple dusting-powder, such as starch, boric acid and talc (1 to 8), stearate of zinc, or lycopodium. Painting the parts with flexible collodion after the vesicles have fully formed makes an admirable dressing. Ointments, as a rule, are not well borne. The Lassar paste (salicylic acid, gr. v; zinc oxide and talc, of each, drachma ij; vaselin, drachma iv) makes a good protective covering.

Internal medication for the relief of the disease while in its course is useless. As a prophylactic, according to Duhring, arsenic is of positive value, and will cure the tendency to the disorder. It should be given in full doses: $\frac{1}{20}$ grain of arsenous acid four times a day, or Fowler's solution, 3 to 7 minims, after meals. Cold sponging of the body each day, especially of the spinal region, followed by vigorous friction, will help to control the tendency.

Literature of '96-'97-'98.

Herpes at the orifice of the external auditory canal cured by tonics and the

local application of yellow oxide of mercury. L. S. Somers (Amer. Medico-Surg. Bull., Oct. 31, '96).

Treatment of herpes of the cornea consists in weak duboisine and eserine; insufflation of powdered iodoform and cocaine, and the same in ointment once daily; occlusion; galvanocautery, if necessary; and, in infecting progressive ulcer, injections, under the conjunctiva, of antitoxin. Balezowski (Rec. d'Ophtal., June, '96).

Herpes Genitalis.

Besnier has lately given the appellation "genitalis" to all forms of genital herpes, and the term is much to be preferred to the older designations: "progenitalis" and "præputialis," neither of which were strictly accurate.

Symptoms.—Burning and itching, with sometimes pain, precede the appearance of the vesicles. Usually there is but one group, but occasionally the number is greater. There are not apt to be as many vesicles in each cluster as is the case in herpes of the face. A reddened oedematous base with a single or at most two or three distinct vesicles upon it is not uncommon. Certain sites upon the genitals seem to be favored by the disease. These, in the order of their frequency in men, are the sulcus, the reflected mucous membrane of the prepuce, the glans, the margin of the prepuce, and the skin on the shaft. (F. B. Greenough.)

In women the sites of preference are the skin of the vulva, the inner border of the labia majora, any part of the labia minora, the prepuce, the clitoris, and the orifice of the urethra. When the lesions are situated upon the mucous membranes the vesicles rupture early and the patient first notices an excoriation, covered by a whitish deposit. Upon the integument of the vulva or penis the vesicles look like tiny droplets of water. They rapidly lose their clear

shining appearance, however, owing to the increasing turbidity of the contents. Crusting follows, and if the disease is not irritated the process terminates by the falling of the scab in from one to two weeks. A pigmented spot remains. This eventually disappears. There is no scar.

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In man the genital herpes is located upon the penis; in woman, either at the urethral orifice or upon the vulva. The base of the ulceration is yellow, but its principal characteristics is its microcyclic and polycyclic vesicle. A most important variety is that which, desicating from the centre to the periphery, assumes a papular aspect and resembles sometimes a chancre, sometimes a mucous patch. Herpes may arise suddenly or by successive eruptions. Its duration is variable, lasting from a few days to several weeks. Fournier (Revue Internat. de Med. et Chir., June 25, '96).

Itching is apt to be severe, especially in women. Neuralgic pain simulating that of zoster is sometimes felt. These cases should be regarded with suspicion, but it is not a wise measure to call every attack of this nature *shingles*.

The lesions in the male are usually situated in the line of the dorsalis-penis nerve. When close set the vesicles may coalesce.

Diagnosis.—The recognition of the disease does not usually present any great difficulty, but care is sometimes needed in arriving at correct conclusions. The mental distress of the patient is generally out of all proportion to the severity of the disorder, and this, coupled with the ease with which the lesions may be confounded with the initial sclerosis of syphilis, makes the subject a fruitful field for the quack and the unprincipled practitioner. Many a young man has had his life made bitter and has parted with his years of hard-

earned wealth because some such scoundrel has pronounced the simple herpetic lesion exhibited a virulent chancre. If the truth might be known many of the wrecks behind the bars of our insane asylums could be traced to this cause. On the other hand, the ease with which syphilitic infection may take place at the site of the herpetic vesicle or excoriation will make the careful practitioner exceedingly guarded in his statements to his patient. He is a physician of very limited observation indeed who has not seen an undoubted case of genital herpes linger along, getting worse instead of better, until it had assumed the classical features of a chancre or chancroid, to be followed by the disastrous results of the one or the other.

If there be a history of exposure to a probable source of infection, sufficient time to exclude the possibility of such infection must be insisted upon before a final answer be given. This, in the case of chancroid, need be but a few days. The pain, the intense inflammation, the formation of a true ulcer, and the development of the single inguinal bubo will tell the story. If haste is necessary the autoinoculability of the secretion may be tried.

If true chancre be expected, at least six weeks from the time of the exposure should be allowed to elapse before a definite decision can be rendered. The sluggishness of the lesion, the induration, the double inguinal enlargements, and the characteristic eruption will distinguish it.

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Differential diagnosis must be made between genital herpes and eczema, or between it and chancre. The vesicles in eczema are microscopical in size and innumerable, and disappear rapidly. The chancre is less superficial than herpes: its borders are more irregular; its base

is also irregular, and accompanied by some enlargement of the glands. By placing upon a piece of glass some scrapings from a soft chancre, there are found elastic fibres which are not met with in herpes. Finally, inoculation with soft chancre shows a redness from its second day, and a vesicle upon the third, which is rapidly followed by ulceration. Fournier (*Revue Internat. de Méd. et Chir.*, June 25, '96).

Etiology.—Herpes genitalis occurs in both sexes, but with relatively greater frequency in the male than in the female. In persons subject to the disorder any irritation of the genital regions is likely to induce an attack. Ungratified sexual excitement, local uncleanness, coitus, masturbation, friction with the underclothing, passage in the male of a sound or pressure in the saddle on horseback or the bicycle are common and fruitful sources of the mischief. In some women it appears at each catamenial epoch, preceding, accompanying, or following the period. It is frequent during pregnancy. Venereal disorders, such as gonorrhœa and chancroid, as has been so well shown by Doyon, are apt to induce it. They are not, however, as he endeavors to show, its invariable precursors. Vaginitis and leucorrhœa are prone to give rise to the disease, the irritating discharges acting as the exciting factor. Fournier and Unna have shown that it is very common in prostitutes and lewd women. In women infected by their husbands with syphilis or gonorrhœa it is said to be infrequent.

From an experience of twenty-four years in the Hospital for Venereal Diseases in Copenhagen, the writer finds that 2.6 per cent. of prostitutes have herpes vulvaris. Out of 877 cases of herpes, 73.4 per cent. of the women were menstruating when examined, and many stated that they had the eruption only at the time of their period. It had no

apparent connection with previous venereal troubles, or with their practice of indulging in sexual intercourse during the flow. Vulvar herpes believed to be nearly always a menstrual exanthem, probably of trophic origin. The vesicles are most numerous immediately before the flow. They appeared in 70 per cent. of the cases on the labia majora. Bergh (Centralb. f. Gynäk., Feb. 8, '90).

Herpes genitalis is a disease of early and middle adult life. It rarely occurs in infancy and seldom after fifty years of age. Like herpes of the face, it sometimes appears to arise without appreciable cause. Disorders of digestion and constipation are named as exciting factors, but it is doubtful if such be the case.

A redundant prepuce is unquestionably an exciting element in men. Balanitis is sometimes regarded as a cause, but the probability is that it is due to the same derangements that induce the herpes.

Prognosis.—Herpes genitalis is a disease that recurs with exasperating frequency and occasionally makes life a burden to its victim. But, aside from the tormenting pruritus and the belief in its venereal origin, it is seldom that it gives rise to much that can be characterized as more than mere annoyance. The patient's fears need to be allayed and faulty sexual habits and hygiene corrected. The tendency of the trouble is toward rapid healing. Where ulceration results from the improper use of caustics the process may be much prolonged and phimosis with distinct narrowing of the præputial orifice may result.

Treatment.—Caustics should never be used in the treatment of herpes of the genital organs. Grave ulceration is liable to result and the more important factor of accurate diagnosis is almost sure to be clouded. The simplest antiseptic washes with absolute cleanliness are

sufficient. Immersing the parts, where possible, in a warm solution of boric acid, or bathing them with the same twice a day and dusting afterward with euophen or aristol, is all that is needed. Weak solutions of bichloride of mercury, zinc sulphate, or potassium permanganate, may be used. Duhring speaks highly of the following formula:—

R Zinci sulphatis, ℥i-5j.
Potass. sulphide, ℥i-5j.
Spt. vini rectificatus, 5j.
Aque, f5vij.

M. Sig.: Shake and apply frequently and freely.

All sources of irritation should be removed. Borated cotton makes a good covering.

For herpes pudendalis, an ointment of 30 grains of tannic acid to the ounce of cold cream used, the mixture to be applied frequently during the day. Many cases seem to be of malarial origin and are benefited by quinine and Fowler's solution. Carstens (Phys. and Surg., Oct., '95).

Literature of '96-'97-'98.

The treatment of herpes is simple. Scratching must be avoided; absolute cleanliness and avoidance of all irritation are imperatively demanded. In the beginning a little lint covered with vaselin is sufficient for genital herpes. Later on, talcum powder or bismuth subnitrate is useful. All measures fail during the acme of vulvar herpes. Cold cream and starch poultices quiet the pain. After the subsidence of this period, baths and inert powders are useful. Buccal herpes calls for nothing but emollient gargles. Fournier (Revue Internat. de Méd. et Chir., June 25, '96).

In dressing the penis no bandage should be used. It interferes with the return-circulation and is liable to induce phimosis. Arsenic may be tried as a prophylactic, and cold sponging of the

body should be practiced daily. In persistent cases the use of the faradic current daily over the spine may be tried.

In patients with a long foreskin circumcision should be advised.

WILLIAM FRANCIS ROBINSON,
Chicago.

HERPES ZOSTER (SHINGLES; ZONA).

Definition.—Herpes zoster is an acute inflammatory disease of the skin, appearing in the course of certain cutaneous nerves, accompanied by severe nerve-pain, usually unilateral in the distribution of its lesions and characterized by the occurrence of groups of firm, tense, globoid vesicles rising from an œdematous base.

Symptoms.—The outbreak of the eruption is nearly always preceded by a severe nerve-pain in the neighborhood of the area about to be attacked. Occasionally it occurs at a considerable distance from the part. The onset of the pain is usually sudden. The patient retires at night in apparent good health and after resting well for a number of hours is suddenly awakened by a "stitch in the side." Or after a hearty meal he lies down for an after-dinner nap and rises at the end of the period with a feeling of general discomfort, quickly followed by fierce stabbing sensations in a given locality. The pain is generally sharp and lancinating, but it may be dull, heavy, and boring. It is nearly always of sufficient severity to interfere with the patient's usual vocations and may become almost intolerable. The rest at night is often broken and the patient then grows pallid from loss of sleep. There is usually no fever or preceding rigor. Sometimes there is slight chilliness, and there may have been malaise and gradually growing indisposition for a number

of days preceding the onset of the attack.

In some rare instances the outbreak is not accompanied by any feelings of distress. This is more apt to be the case in children than in adults.

The appetite for the most part remains good; but, owing to the insufferable nature of the pain, nausea and even anorexia may at times be incited. The functions of the different organs are, in general, conducted with their ordinary regularity.

The attack of pain may make its appearance days and even weeks before the eruption shows itself, but usually the vesicles follow in the course of a few hours. A reddened or bluish-red patch of the size of a half-dollar silver piece or larger is first exhibited. This area rises to the height of two or three lines, is sharply defined, and is exceedingly tender to the touch. So painful is it that often the friction of the clothing can scarcely be borne. The discoloration deepens and there is a sensation of heat or burning in the patches. In a very short time the vesicles appear.

The vesicles in herpes zoster when fully formed are unlike those seen in any other disease of the skin. They rise from the surface of the œdematous patch freely and distinctly, often having the appearance of being stuck on instead of forming an integral part of the tissues. They are tense, clear, and glistening, are oval or circular in outline, are always in groups, and the roof-wall in each is so firm that they do not ordinarily rupture unless subjected to mechanical violence.

At the outset the vesicles are filled with clear, translucent serum. This, in the course of a few days, grows cloudy in color and later becomes purulent. Hæmorrhage sometimes discolors the

contents of the lesions. The number of vesicles in each group varies from three or four to one or even two dozen. They are usually from a split pea to that of a coffee-bean in size, but occasionally when very numerous are not larger than a mustard-seed. When small the lesions are much more likely to break down. In most cases from three to a half dozen groups may be found, but this number may be less or it may be greatly increased. The clusters are generally found following the course of a certain cutaneous nerve; but, because of the overlapping of the filaments from different trunks, it is frequently difficult to determine the particular branch which is affected. The distribution is nearly always unilateral, but where the disease is severe the limits of demarkation are not sharply drawn at the median line, and the disorder may trespass upon it to a marked extent. This is due to the extension of nerve-filaments from one side of the body to the other.

Attention called to the great infrequency with which herpes zoster affects two widely-separated regions. Case observed of a middle-aged man who presented the lesions of the disease on the left side of the thorax, on the inner aspect of the left arm, and on the left side of the forehead. Bradshaw (*Lancet*, Oct. 13, '94).

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Notwithstanding the common opinion as to the strict delimitation of the vesicles of zoster over a determined nerve-territory, the writer finds in a large number of subjects vesicles disseminated over the entire tegumentary surface. These vesicles resemble those proper to zona, and, if their evolution is studied, it is found that they belong properly to the zoster, and are not pustules of self-inoculation. Jeanselme and Leredde (*Gaz. Hebdomadaire de Méd. et de Chir.*, July 28, '98).

In so-called double zoster the girdle, or zone, about the body is complete. This form of the disease is exceedingly rare and is very apt to be productive of great distress. The belief, however, in the fatality once accorded it has not been shown to be founded in fact.

The pain is the chief symptom of annoyance complained of. At times there may be more or less of itching and burning sensations, but these are not apt to occasion marked distress. The pain usually persists throughout the course of the eruption and subsides as the vesicles disappear, but it may endure for an indefinite period after all trace of the skin trouble has vanished. Weeks, months, and even years, with complete shattering of the nervous system, have been recorded of such continuance. Age has a decided influence upon the character of the pain. In children it is ordinarily mild, while in the aged it is apt to be extreme in its severity.

Case of a child suffering from reflex epileptic convulsions, which supervened upon an eruption of herpes zoster occurring in the distribution of the superior superficial branches of the cervical plexus, the left side of the head, neck, shoulder, and upper part of the thorax being affected. With the disappearance of the eruption the convulsions ceased. Byron (*N. Y. Med. Jour.*, Jan. 10, '91).

The pain is more decided when the head is attacked than in the regions of the trunk or limbs. In rare instances complete anæsthesia of the part follows or anæsthesia dolorosa may supervene. Motor as well as sensory disturbances exhibited in local paralyses may occur.

Case of an old woman who, while suffering from a subacute attack of rheumatism, developed neuralgia of the right side of the neck and face with an eruption of herpes zoster. The eruption followed the course of the superficial cervical plexus and the facial nerve. After a few days a complete Bell palsy occurred.

In the course of four months, under treatment, the palsy disappeared. H. A. Spencer (*Lancet*, June 9, '94).

Case of herpes zoster with facial paralysis and another with sensory disturbances. The writer agrees, with Recklinghausen, that there is a primary



Herpes zoster, with facial paralysis.
(*Ebstein.*)

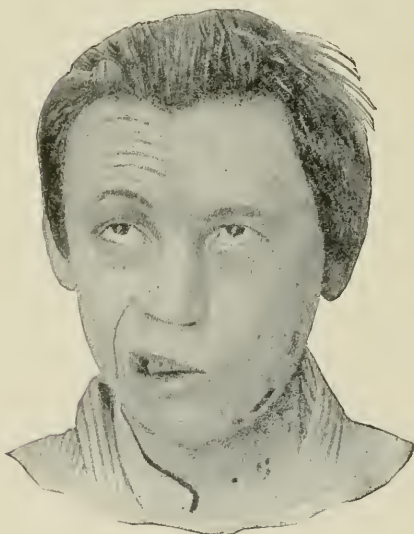
affection of vasomotor nerves, the vasodilators being irritated, and looks on the herpes as an intense angioneurotic disturbance which may be associated with diseases of the motor or sensory, spinal or cerebral, nerves.

In most cases the disease results from causes acting on the body in general, though trauma and cold may assist. It is possible that infection or autointoxication plays a part. Ebstein (*Virchow's Archiv*, B. 139, H. 3, '95).

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Typical case of herpes zoster, affecting the entire right side of the neck and face, corresponding with the lower region of the cervical plexus, observed in a man 75 years old. After ten days of acute suffering total paralysis of the right facial nerve suddenly set in. The pain and the paralysis gradually diminished, and finally disappeared after from two to three weeks' treatment by the galvanic current. Olaf Frich (*Norsk Mag. f. Lægeordenskab.*, p. 1125, '96).

Combination of herpes zoster and facial paralysis very rare. Ebstein was able to collate but eleven cases. The author has found seven others, and adds the following of his own: a woman, aged 20 years, no nervous disease in family. Trouble began the day after sitting in a draught, with a drawing sensation in right side of face, slight tenderness over right eyebrow, followed by pain radiating from neck to back of head and on right side. On the third day a total right-sided facial paralysis. Four days later a vesicular eruption on the lower half of the right ear and in the auditory canal, on the right half of the tongue, uvula, and palate. The paralysis was very marked, with complete reaction of degeneration. The tongue protruded straight; touch and taste unimpaired. Sensation of face intact. No tenderness at points of exit of the fifth and seventh nerves. No cerebral symptoms. So far as the author knows,



Herpes zoster, with facial paralysis.
(*Ebstein.*)

this is the fourth case in which the paralysis preceded the herpes. The phenomena in this case may be explained as follows: The trigeminal branches were involved; the lingual herpes was caused by continuation of the inflammation

from the facial to the chorda tympani and affected only its trophic fibres. Eichhorst (Centralb. f. innere Med., No. 18, '97).

Loss of hair and teeth and atrophy of the muscles have been noticed (Strübing). The disease is usually benign and acute, running its course in from three to six weeks.

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Zona may appear under three different conditions: First, toward the end of severe pulmonary tubercle, and it is then of no special interest; but in other cases it is a very early symptom, and may be looked upon as a premonitory sign. Cases cited of patients subject to herpes zoster, but who did not complain of any pulmonary affection. On examination of the lungs, however, early tuberculosis was discovered. In other cases, forming the third group, the signs of pulmonary tubercle may be discovered after a short interval, there being no physical indication at the time of the eruption. Ronher (Jour. de Méd., Apr. 10, '97).

Resolution takes place by absorption of the vesicular contents or a crust forms which desiccates and is then exfoliated.

Indelible scars are occasionally left at the sites of the vesicles. They have a punched-out appearance, as if a nail-head had been driven sharply into the skin and had left its impress upon it. These scars should never be mistaken for the relics of syphilis. The disease when attacking the region of the eye is apt to be unusually severe, and death has been known to follow. The eyesight is frequently endangered.

In virulent types of zoster hæmorrhage into the vesicles may take place, giving them a bluish or blackish appearance (zoster hæmorrhagicus). An abortive form of zoster, in which the pain appeared in typical manifestation, but without the development of vesicles, has been noticed.

Coalescence of the vesicles often takes place. Where the blebs are opened dirty, grayish ulcers are apt to form. These ulcers are decidedly rebellious to treatment and invariably leave scars. All of the groups do not usually appear at the same time, but come out one after the other at intervals during the first week or ten days. They enlarge somewhat, but seldom unite.

REGIONAL ZOSTER.—Herpes zoster may attack any part of the body, but it apparently exhibits a preference for certain sites, and to its appearance in these localities certain names indicative of the region affected are given. Thus we have zoster capillitii, z. frontalis, etc. When the disease invades two adjoining regions more precise terms, such as zoster cervico-brachialis, z. intercosto-humeralis, and so on, are used. The general features of each are the same, but, owing to anatomical differences, some characteristics need special description.

Zoster is not infrequently found attacking the various regions of the head. In the scalp (z. capillitii) the lesions are apt to be the seat of severe burning sensations, the occipital region being most often the part affected. Over the forehead (z. frontalis) disfiguring scars are likely to result. The branch of the supra-orbital nerve that passes upward is here the one that is usually involved. The ear (z. auricularis) is sometimes attacked, and the cheeks, side of the nose, and chin are not unusual sites. The disease may appear in the mouth-cavity (z. buccalis), upon the inner wall of the cheek, and the gums. Zoster exhibits its greatest severity when the eye (z. ophthalmicus) is attacked. The first branch of the fifth nerve is then affected. The nasal filament of the same nerve is often implicated and the eruption extends downward upon the nose and

cheek. The pain is severe. The conjunctiva is reddened and swelled, the cornea is inflamed, and iritis may follow, with marked disturbance of vision and œdema of the neighboring parts. In its severer forms disintegration of the eyeball with loss of sight occurs and a resulting meningitis may lead to a fatal issue. Sympathetic involvement of the other eye may take place.

While we must regard zoster of this region as a grave affection liable always to destroy the eyesight and endanger life, yet instances are on record in which the attack, though serious, resulted most favorably.

Case of bilateral zoster ophthalmicus occurring in a patient suffering with chronic pneumonia and diffuse interstitial nephritis. The case was anomalous in that the attack came on without pain and exhibited a variety of lesions. The eruption consisted of pustules, vesicles, and bullæ occurring at the same time. By the end of the third day these lesions had broken down completely, forming freely-discharging ulcers. The greater part of the face-region was affected. The disease ran its course in three weeks and ended in complete recovery. Robertson (London Lancet, July 7, '88).

Zoster is more frequently encountered on the surface of the thorax (z. pectoralis) and the neighboring abdominal (z. abdominalis) parts than elsewhere on the body. The right side is more often affected than the left. In the thoracic region the intercostal nerves are attacked. The pain is marked and when occurring before the eruption appears is apt to be mistaken for pleurisy. The presence of fever is needed to establish the latter affection. In zoster of the thorax considerable interference with breathing is liable to be experienced, owing to the pain occasioned by movements of the chest-wall. Duhring notes that the pain here may simulate the dis-

tress occasioned in angina pectoris. Because of the peculiar distribution of the diseased areas in these parts in the form of a belt or girdle has arisen the common designations of zoster as zona or cingulum. It is not unusual for the disease to be preceded in this situation for some time before its eruption by its characteristic pain. The nerves affected in abdominal zoster come from the dorsal and lumbar portions of the cord.

Two cases of thoracic herpes zoster in which a diffuse radalgia was observed. This is a painful sensation in the spinal region, both spontaneous and increased by pressure. It is localized along the chain of the spinal apophyses and a little on each side of these, and extended from the third dorsal to the second lumbar vertebra in the cases observed. In some cases zoster is a dermato-neurosis indicative of disturbances of nutrition of the nerve-elements in course of the evolution of an infectious malady. Terré (Edinburgh Med. Jour., Sept., '90).

Herpes zoster brachialis involves the shoulder and upper arm to the elbow. It may extend down the forearm, and even as far as the finger-tips, attacking the palmar surface of the hand; but this is rare. The flexor surface of the arm is more often selected than is the extensor.

Case of herpes zoster occurring on the back of the thumb and on the skin covering the carpo-metacarpal joint of the right hand, accompanied by hyperæsthesia, pain, and paresis of the arm, occurring during an attack of measles. The symptoms were referred to the radial and circumflex nerves. Adenot (Revue de Méd., July, '91).

In zoster femoralis the disease spreads over the buttock, thigh, and down the leg. It usually does not go below the knee and the feet are as seldom attacked as are the hands.

Case of universal zoster. The subject was a man, 30 years of age, who had suffered from two severe attacks of

malaria. The first occurred at the age of twenty-seven and lasted for a number of months. At thirty he was affected a second time with the disease. This was accompanied by severe neuralgic pain and burning sensations. Within a few days from the beginning of the fever the zoster appeared and was universal in its distribution. Even the conjunctiva and the mouth, nose, and anal cavities were invaded. Colombini (*Commentaris Clinico delle Mal. Cut. e Genito-Urin.*, '93).

ZOSTER ATYPICUS GANGRÆNOSUS ET HYSTERICUS.—Kaposi noted a peculiar form of recurring herpes in a number of cases reported by him to which he gave this name. Three of the subjects were women and one was a man. In all distinct symptoms of hysteria were present. In each case the eruption consisted of vesicles and papules gathered in groups. A central crust formed in each vesicle and about it there developed a number of tiny pustules. A number of the lesions coalesced, and gangrene of the part followed. After separation of the slough and healing by granulation had taken place, keloid formed in many of the cicatrices. The period of development lasted for about eight days, when subsidence began to take place. Both sides of the body were affected and in all but one case a number of recurrences took place.

Diagnosis.—The recognition of herpes zoster does not usually present any great difficulty. The severity and peculiar character of the pain, the grouping of the large, firm vesicles upon an erythematous base, the lesions running their course without rupturing, and the common limitation of the trouble to one side of the body and in the line of some cutaneous nerve are the distinctive features that differentiate the disease.

At times **HERPES SIMPLEX** assumes some of the severer features of zoster, or

the zoster may be so mild that its manifestations partake of the benign nature of the simple disease, in either of which cases some difficulty may be experienced in determining the true nature of the disorder. This, however, is but a matter of little moment so far as treatment or prognosis is concerned. It but emphasizes the close relationship of the two affections.

ERYSIPELAS begins with a marked rise in temperature, the area affected increases gradually by peripheral extension, there is seldom any formation of vesicles, and the peculiar bluish hue of the disease is never seen in zoster.

With **ECZEMA** zoster need never be confounded. The vesicles are wholly unlike. Those of eczema are small, thickly and irregularly scattered over the surface, and they rupture readily, while a continuous flow of serum follows their dissolution.

Three laws given by which to recognize skin diseases owning an origin in some disorder of the nervous system:

1. The disease will not occur in round patches, nor in oval ones, nor in streaks, but will be arranged according to the branching distribution of the filaments themselves; it will be panniculate or corymbiform.
2. There will be no power of infecting adjacent structures; the patches will not be serpiginous.
3. The diseases develop themselves fully in the first instance; the results, when once declared, do not increase. From the fact that when herpes zoster, if it occur a second time in a patient, never affects exactly the same area, the conclusion is drawn that the nerve is disorganized by the kind of neuritis which produces the original attack of zoster, and so is incapable of being involved a second time. Hutchinson (*Illus. Med. News*, Jan. 26, '89).

Etiology.—The surface-lesions in herpes zoster are produced by an inflammation of the nerves supplying the parts. This neuritis may occur at any point in

the track of the nerve, in the ganglion through which the nerve passes, or in the central nervous system. The skin-manifestations, while of the greatest interest, are entirely secondary to the nerve-disturbances. They are the superficial indications of serious trouble deep within the body.

Tuberculosis is a predisposing factor to herpes zoster. It may lead to herpes directly by implication of the intercostal nerves adjoining the diseased pleura, but, as a rule, there is some added determining cause, as intoxication by lead, alcohol, or uræmia, or some infection, as in one of the writer's cases in which the immediate cause was influenza. Huchard (*Union Méd.*, No. 42, '94).

Several cases in which an eruption of herpes zoster has followed some cause producing mental emotion or anger. Roche (*Lancet*, Oct. 13, '94).

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Case of a woman, aged 25, from whom six teeth were extracted under gas. Six days afterward a marked herpes zoster appeared in the right axillary region and over the right mamma. George Pernet (*Brit. Med. Jour.*, Jan. 30, '97).

The list of causes known to be operable in the production of the disease is a long one. These different agents vary greatly in their nature, but their action is alike in that the irritation of each, operating upon the nerve, is sufficient to induce a true inflammation of its substance.

Climatic influences are most prominent.

Epidemic herpes zoster considered an infectious neuropathy, prevailing epidemically under the influence of climatic conditions not as yet understood. Weiss (*Archiv f. Derm. u. Syph.*, H. 4, 5, '90).

Sudden changes of temperature, exposure of the body when warm to a draft of cold air, a cold plunge into the water, lying out on the damp grass at night;

getting overheated in close, hot cars, theatres, ball-rooms, or elsewhere, and then going suddenly into the cold, outer air; in short, any change whereby the surface-temperature of the body is rapidly lowered is capable of producing the disease.

Next in order are injuries of the body. These may be slight or severe. Blows upon the head or over the spine, surgical operation, the prick of a thorn (Janin), the opening of an abscess, gunshot wounds, or the pulling of a tooth have been followed by the disorder.

Poisoning with sewer-gas will produce the disease. The use of the faradic or galvanic current may induce it. The internal administration of arsenic (Neilsen) is a well-known factor in its production. It has followed the ingestion of a large dose of Cayenne pepper (H. W. Blanc). Mental exhaustion, overwork, worry and sudden exertion may give rise to the malady.

Undoubted instances of infection have occurred. One of the most remarkable was recorded by Walther and quoted by Duhring.

[This case, given in "Text-book of Cutaneous Medicine," vol. ii, p. 485, deserves further mention. A student was attacked by herpes zoster. He was removed from his room, which shortly afterward was occupied by another person. This person in a few days' time was taken with the same disorder. He, too, was transferred and the room leased to a third occupant, like the first, a student, who straightway developed a case of zoster. Numerous epidemics have been observed, the most notable among which are those recorded by Kaposi in Vienna in 1888, and by Weiss at Prague. The latter observer noted fifteen cases in less than two months. The nature of the epidemic, coupled with the season at which it occurred, led Weiss to regard the infectious agent as one peculiarly dependent upon climatic influences: a

supposition that coincides with our general knowledge of the disorder. WILLIAM FRANCIS ROBINSON.]

Nerve-lesion in herpes zoster is probably due to some micro-organism. The disease considered infectious, like croupous pneumonia. Kaposi (*Wiener med. Woch.*, Nos. 25, 26, '89).

The disease may occur at any age and in either sex. It is most frequent in early spring or late autumn: seasons when marked changes in temperature are liable to take place.

Zoster occurs in about 2 per cent. of the cutaneous diseases of children. It is most common between 4 and 6. Lee (*Med. Press and Circular*, June 27, '88).

Herpes zoster is rare among children. Most children suffering from herpes zoster show digestive troubles. After the tenth year children suffering from zoster seem to be liable to neuralgic pains. The treatment is local and protective. Droixhe (*Jour. d'Accouche.*, Nov. 30, '89).

In a series of 235 cases of herpes zoster 45 per cent. were males; most cases occurred between the ages of 10 and 15. The greater proportion of cases occurred in the spring months. In most cases the sensitive fibres of the nerves alone were affected, but 2 cases of marked facial paralysis came under notice accompanying herpes zoster of the face or head. Herpes zoster cannot be shortened in duration or the eruption aborted. Irritation should be avoided and the vesicles should not be broken. Greenough (*N. Y. Med. Jour.*, Oct. 19, '89).

Pathology. — Barensprung demonstrated that the disease was primarily one of the ganglionic system, and this has been confirmed by numerous other investigators. Wyss examined a case dead of zoster facialis, and found the ganglion of Gasser enlarged, soft, and deeply injected. The nerve between the brain and ganglion was surrounded by extravasated blood. It was healthy at its origin. The peripheral filaments were infiltrated with soft tissue.

In a case in which the first branch of the trigeminus and the naso-ciliary branch were the nerves attacked found, at the necropsy, the interstitial tissue of the Gasserian ganglion infiltrated with inflammatory products and the ganglion-cells destroyed. The ciliary nerves were likewise found affected. Daniellsen found the intercostal nerve reddened and thickened and the neurilemma markedly infiltrated in a case of zoster of the trunk.

Later studies have confirmed the statements of these older observers, but they have also added much to our knowledge. We now know that the ganglion is not alone the part that is first attacked, but that the inflammation may arise at any point in the continuity of the nerve-trunk in its peripheral termination, in the spinal cord, or within the brain. When the brain or spinal cord is the seat of the trouble, bilateral zoster is apt to follow. This is rare. In the case of zoster following blows and injuries to the skin only the terminations of the nerves appear to be affected.

The skin-lesions of zoster have received much attention. Biesiadecki and Haight were the first who made a careful study of the vesicle. They found that it began in the deeper layers of the rete and that the exudation forcing its way upward separated the rete-cells, forming elongated bands or threads. After reaching the horny layer the fluid—no longer able to make its way between the cells—lifted the epidermal layer bodily, thus forming the roof-wall.

Robinson's investigations led him to the discovery of a perineuritis of the cutaneous nerves exhibiting a small-celled infiltration of the neurilemma.

Unna found that the vesicles in herpes zoster had a structure distinctively their own, due to a peculiar form of

epithelial degeneration to which he applied the term "ballooning." In the process of colliquation that here takes place the cells increase greatly in size, becoming, in many instances, hollow spheres, and in others with one side drawn out, suggestive of a balloon. Other unique and various forms are assumed. The protoplasmic contents are converted into a fibrinous opaque mass, the nucleus is divided into a number of daughter-bodies that do not wholly lose their nuclear character, and the prickles are lost, thus severing the union of the cells the one with the other. In this disorganized condition the cells separate and accumulate in the hollow of the vesicle.

From the roof-wall of the lesion are seen hanging a number of compressed, cord-like, epithelial cells, forming a species of partition, thus dividing the cavity apparently into a series of compartments. But because of the indifferent connection possible in cells undergoing this form of degeneration there is no real division of the vesicle. The vesicle-contents, in addition to the degenerated epithelium and giant cells, consists of coagulated fibrin. Into the base of the vesicle can usually be seen projecting the denuded summits of the papillæ. The vesicle is situated well within the epithelial tissues.

When the acme of vesicle-formation is reached marked emigration of leucocytes from the neighboring vessels into the papillary body and the vesicle takes place. It seems, however, never sufficient to fill the cavity of the blister, crusting and desiccation taking place before this condition is reached.

What appears peculiarly striking is the relatively unimportant changes that take place in the epidermis around and beneath the vesicles. The blood-vessels and lymph-spaces are dilated for but a

few lines only. The sweat-glands are not affected. The hair-follicles share in the process inasmuch as the prickle-cell layer dips downward toward their base. The cutis is affected in a slight degree only and that mainly in the infiltration of a few leucocytes.

Pfeiffer was the first to call attention to some peculiar bodies in the vesicles of herpes zoster.

[Pfeiffer (Monat. f. Prakt. Derm., p. 589, '87) regarded these bodies as organisms belonging to the protozoa and the probable cause of the disease. Hartzell (Jour. Cut. and Genito-Urin. Dis., Sept., '94) examined these same structures carefully and came to the conclusion that they were not protozoa, but the products of cell-degeneration, and had nothing to do with the origin of the disorder. T. C. Gilchrist (Johns Hopkins Hosp. Reports, vol. i, '96) made an exhaustive study of the subject, examining, in all, twenty cases. He found the bodies in sections of tissue taken from the skin in the erythematous stage of the disease as well as in the vesicles. In no case could he discover amœboid movement. He describes them as bodies having a well-defined outline with granular contents. They were found singly and in groups. In the vesicles they were gathered at the sides and bottom. Some large groups were found where no vesicle-formation could be detected. The author thinks that the bodies are the nuclei of epithelial cells or eleidin granules similar to those found in the mucous layer. WILLIAM FRANCIS ROBINSON.]

Prognosis.—Herpes zoster runs its course usually in from three to six weeks. Abortive types may end in ten days or less, while the severer forms may be much prolonged. The disease is rarely fatal, save when the ophthalmic region is attacked. A lethal issue is then possible, and the eye may be sacrificed even if life be spared. Scarring is a not infrequent sequel of zoster if the vesicles be broken. The cicatrices are gathered in clusters typical of the grouping of

the disease, and each has an angular outline with precipitous edges that gives to it a distinct and unmistakable individuality. Long continuance of the neuralgia may vex and weaken the nervous system until the subject becomes a complete physical and mental wreck. Such cases are, however, exceptional. Double or bilateral zoster is rare. We can explain its occurrence upon the assumption of a neuritis within the central nervous system, or, at least, beginning there. Its increased severity is, no doubt, due to the greater involvement of nerve-trunks, but the gravity that once was supposed to attach to the trouble has been disproved.

Herpes zoster recurs so seldom that one attack is believed to render the patient immune.

Treatment.—Herpes zoster is a self-limited disease, rarely endangering life and seldom recurring. Its treatment is, therefore, simple. The most urgent indication with which we have to contend is relief of the pain. This is sometimes nearly unbearable. The character of the distress is likened often by the patient to that of a red-hot iron drilling into the flesh. Sleep then is impossible, and the restlessness is extreme.

The subject affected should be put to bed and absolute quiet enjoined. Freedom from worry and care, coupled with complete physical relaxation, is essential to the best results to be obtained from treatment. The bowels should be moved freely. For this purpose a mild dose of calomel given at bed-time, followed by a brisk saline cathartic in the morning, answers well. To keep the bowels open a glass of warm Hunyadi water, or a Sedlitz powder may be given each day before breakfast.

The diet should be light and easily digestible. Milk freely if the patient can

tolerate it, broths, soups, soft-boiled eggs, oysters in season, fish, and chicken should constitute the list from which the articles of food for the patient's need may be selected. These patients often have very good appetites, and care should be exercised in not allowing overindulgence, such a course usually being followed by marked aggravation of the pain.

Internal medication has not as yet shown itself capable of shortening the course of the disease. But there are a number of drugs that markedly affect the pain and make the patient's condition bearable. Chief among these is zinc phosphide. This may be given in doses of $\frac{1}{6}$ to $\frac{1}{3}$ grain in tablet form every two or three hours until the pain is under control, when the dose may be reduced. It is sometimes more effectual when combined with the extract of nuxvomica, $\frac{1}{8}$ to $\frac{1}{4}$ grain of the latter drug being used. Sodium salicylate and salicin in 10-grain doses every four hours, especially if there be any rheumatic taint, are often productive of much good. Antipyrine, phenacetin, and other drugs of the series relieve the pain, and it is thought have even shortened the course of the disease (Jennings). Arsenic is often used, but we should not forget that it is capable of producing the affection, and therefore likely to aggravate, instead of benefiting, the disorder. When employed it should be used in full doses, $\frac{1}{20}$ grain of arsenous acid in tablet form, or combined in a capsule with a small amount of iron, being given four times a day. Or 3 to 5 minims of Fowler's solution in water after taking food may be used. Quinine in full doses is serviceable when malarial poisoning is the basis of the trouble. Camphor in small doses often repeated has been found to give the patient comfort.

Case of herpes zoster of unusual distribution, occupying the auricular, lower maxillary, and cervical regions. The pain was very severe. Opiates had been used without relief. Camphor given internally in 5-minim doses of spirit of camphor on sugar three times a day. There was a remarkable improvement almost immediately. Drinkwater (Brit. Med. Jour., Apr. 13, '95).

If there be much nervousness, the bromides of sodium and potassium may be needed, but it is best to do without these drugs if possible. Tincture of aconite in drop-doses at intervals of two hours has proved serviceable. Sodium hyposulphite in 5-grain doses every three hours does good.

It will be seen that the list of drugs employed is a long one, which being rightly interpreted means that no one of them is infallible, but that all will fail at times to produce the results expected. If we cannot control the pain by drugs given by the mouth we may resort to hypodermic injections. Ten minims of chloroform will usually be sufficient to check the pain. Cocaine may also be used, but it is best to avoid this drug, owing to the danger of inaugurating the habit. Morphine sulphate given sub-cutaneous in from $\frac{1}{4}$ - to $\frac{1}{2}$ -grain doses will always control the pain. It is well to combine this drug with the sulphate of atropine, using $\frac{1}{100}$ to $\frac{1}{60}$ grain of the latter.

External treatment should not be neglected. The vesicles should be preserved intact if possible. Opening them will not shorten the course of the disease or mitigate the distress in any particular, and it nearly always results in the production of an obstinate ulcer that leaves an ugly scar. No picking or rubbing of the lesions should be permitted, and all sources of irritation—such as harsh woolen underclothing—should be removed. Dressings that protect the

lesions from the air should be employed. One of the best applications that can be used is alcohol.

[This was well demonstrated by De-loir (Brit. Jour. of Derm., vol. iii, p. 269), and Duhring has called especial attention to it in his recent edition of "Cutaneous Medicine." WILLIAM FRANCIS ROBINSON.]

It should be used in full strength, 94 per cent., and at frequent intervals. Compresses of cotton or soft-linen stuff should be saturated with the alcohol and bound over the parts. To prevent evaporation, these should be covered with some impermeable material, such as oil-silk or gutta-percha. This gives prompt relief to the burning and local distress, and affords the patient much comfort.

Ointments and pastes can often be used to advantage. Lassar's paste (see HERPES SIMPLEX) is useful. When properly made it furnishes a good protective dressing. It should be thickly applied and then thoroughly dusted over with a simple powder, such as talc or corn-starch. Anodyne remedies—such as opium, belladonna, or cocaine—may be added to it if needed. It is capable of relieving the cutaneous symptoms, and under it the lesions dry up and heal without rupturing. Simple ointments may relieve the itching and burning, but their softening influence upon the epidermis renders the rupture of the vesicle more probable.

Lime-water, black-wash, carron-oil, and lead-water washes may be found useful. They should be applied freely, the surface being kept constantly moist with gauze saturated with the agent chosen. Lotions of carbolic acid and camphor, $\frac{1}{4}$ to $\frac{1}{2}$ drachm of each to the ounce of alcohol, are valuable. The following substances in alcoholic or aqueous solution are often found useful: Tannin, 30 to 60 grains to the ounce; menthol, 5

to 15 grains to the ounce; benzoin tincture, 30 minims to the ounce; resorcin, 5 to 15 grains to the ounce. These should be applied freely to the affected parts and allowed to dry, after which a dusting-powder may be used with advantage. Such may be made of zinc oxide, starch, boric acid, lycopodium, or talc. Anderson's dusting-powder—which is compounded of camphor, zinc oxide, and starch—is especially useful.

Liquid thiol diluted with an equal part of water, or with twice the amount of ether, applied in herpes zoster with beneficial result. Stepp (Münch. med. Woch., Jan. 6, '91).

In herpes zoster local sedatives to the vesicles recommended when the case is typical. Thick bandage is applied over a dusting-powder composed of amylum, or amylum and opium, to reduce pain and keep the part dry; a layer of wadding is placed over these.

In zoster hæmorrhagica, or where the vesicles are closely set, the affected parts must be carefully protected lest they be torn. With this object in view the following ointments were prescribed:—

R Boric acid, 75 grains.

Glycerin, q. s. to make a solution.

R Simple ointment, 5 ounces.

Cocaine or extract of opium, 22 grains.

In cases in which neuralgia is a complication Fowler's solution is invaluable. Kaposi (Med. Press and Circular, Jan. 16, '95).

In herpes zoster treatment should always be begun by the administration of a saline purge, preferably sulphate of soda. In dealing with the eruption the effected part must be kept absolutely dry; the painful region should be covered with a layer of cotton-wool, sprinkled with the following powder:—

R Starch-powder, 2 ounces.

Oxide of zinc, 4 to 5 drachms.

Powdered camphor, 15 to 45 grains.

Crude opium powdered, 15 grains.

For the neuralgia the following pills are given:—

R Extract of stramonium.

Extract of hyoscyamus, of each, $\frac{3}{20}$ grain.

Extract of belladonna, $\frac{3}{40}$ grain.

To make one pill.

Four of these to be taken daily.

If these pills do not relieve the pain, antipyrine must be given internally. A. Robin (Bull. de Thér., Oct. 30, '95).

Literature of '96-'97-'98.

A dusting-powder composed of equal parts of subgallate of bismuth and talc is a useful application in herpes zoster; where this does not prove effective, an ointment containing 1 part of subnitrate of bismuth to 3 parts of cold cream will relieve the burning. For the neuralgia which so often accompanies or follows it, quinine in large doses given two or three times a day, continued to the point of tolerance, is the best remedy. Careful nursing and management are important adjuncts to the treatment. Weber (N. Y. Med. Rec., July 9, '98).

Where tenderness can be detected over the exit or in the course of a spinal nerve the wet cup may be tried. Not more than 1 ounce of blood should be abstracted. Or a blister may be applied. For this purpose cantharidal collodion answers an admirable purpose, and frequently gives marked relief.

Paquelin cautery at a red heat used in the treatment of the neuralgia of zoster, cauterizing the skin over the origin of the nerves superficially, but not enough to produce scarring. Elliot (Jour. of Cut. and Genito-Urin. Dis., Sept., '88).

Literature of '96-'97-'98.

In nearly all cases of herpes zoster a tender spot may be found higher up over the nerve-trunk. At this point the application of a counter-irritant in the form usually of flying-blisters or turpentine recommended. Theodore Wilkins (Med. Rec., Sept. 26, '96).

Duhring speaks very highly of the use of the constant current in the treatment

of zoster. Its use wherever possible is to be commended. From five to ten cells of the ordinary zinc carbon battery should be used. The negative pole should be placed over the seat of the eruption and the positive grasped in the patient's hand; or, better still, be passed up and down the spinal column. The belief exists that if used early enough it will abort or greatly shorten the course of the disease. Certain it is that it will greatly subdue and soften the pains of the disorder. It is of the greatest value in the lingering pains that remain after the zoster has subsided. In such cases the current should be used two or three times daily, fifteen minutes being given to each application.

WILLIAM FRANCIS ROBINSON,
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HIP-JOINT DISEASE.

Definition.—What is usually known as “hip-joint disease” is a tuberculosis of the hip-joint; but tuberculosis, by no means, includes all the diseases which may affect the hip. The hip may be affected by tuberculosis, by syphilis, by rheumatism, and by a variety of acute infectious processes subsequent to the occurrence of some acute infectious disease in other parts of the body, or may be the seat of a simple synovitis caused solely by trauma. A synovitis of the hip is usually associated with ostitis, but a synovitis may exist independent of ostitis and subside without the occurrence of any involvement of the bones.

The hip-joint is also the seat of arthritis deformans and Charcot's disease, though the latter is rare; and occasionally loose bodies are found in it. Malignant tumors also may affect the hip.

Functional affections of the joint are usually traumatic neuroses, but may be considered here.

Symptoms.—The symptoms of *inflammation* in the hip vary somewhat, according to the character of the inflammation present. If the hip is the seat of an acute synovitis, pain will be felt in the hip itself, which will be intensified by movement of the joint or by pressure over the neck of the femur at a point between the great trochanter and the crest of the ilium. The position of the limb is very characteristic. The thigh is flexed upon the abdomen, abducted, the toes everted, and the entire limb rotated outward. This position allows the capsule to contain the largest amount of fluid, and, in consequence, is the position of ease which the joint naturally assumes when overdistended. In cases of this sort, also, there is usually a distinct history of a traumatism immediately preceding the occurrence of pain. These cases are also extremely sensitive to any sort of motion. In standing the patient bears all the weight of the body upon the sound side, and in consequence of the position of the affected thigh, the gluteo-femoral crease on this side is much less distinctly marked than on the well buttock. In cases where the joint is the seat of an acute infection, following measles, scarlet-fever, or the like, the same train of symptoms will be present, though the progress of the disease will be much more rapid, while, combined with the local symptoms, will be found those of general systemic infection, and under these circumstances disintegration of the joint may progress with remarkable activity.

In *syphilis* of the hip, on the contrary, the disease may have been present for months without the occurrence of pain sufficient to attract the parents' attention. It is only when a marked limp becomes noticeable that medical advice is sought, and in some of these cases when marked deformity is present and joint-

spasm is very pronounced, manipulation seems to give rise to but trifling inconvenience, and the parents at times are loath to believe that serious trouble exists, because the child complains so very little.



Fibrous ankylosis of the left hip-joint following typhoid fever, relieved by *brisement forcé*.

In tuberculosis of the hip the pain at the outset is not apt to be marked; but, should an abscess form in the femur or the disease progress until the cartilage

becomes involved, the pain becomes most exquisite, children often crying severely from the jar occasioned by a person walking on the floor, and so shaking the bed.

In some of these cases there is a distinct history of traumatism, and in others it seems impossible to find precisely when the disease began. Many of the cases which come to the surgeon with the history that the first symptoms were noted by the parents a few days previous, being evidently of very long standing. The inattention of the parents to the trifling limp which the child exhibits, and the fact that it did not at first complain of pain sufficiently to attract their attention, being responsible for this. Quite frequently these children complain of being stiff on rising in the morning, and exhibit a decided limp, but after having been at play for some hours they run in almost a natural manner, and so little is thought of it. In some cases this limp gets better and may almost disappear for a number of weeks, occasionally a couple of months, then reappear in a still more aggravated form, to subside once more, and again reappear. It is unusual, however, for cases to pursue this course, and the majority grow progressively worse, and do not, unless treated, exhibit these periods of freedom from symptoms.

Literature of '96-'97-'98.

In hip-joint disease the first symptom in the majority of cases is a limp, and this is generally worse in the morning. It frequently disappears for a time, and then returns. The next most frequent symptom is pain, which may be either at the hip or the knee. By carefully contrasting the motions of the two hip-joints it is not difficult to detect the restriction of the motions in the affected joint.

In examination all rough handling of the joint, and particularly pounding on the heel, or similar methods of trying the effect of concussion on the joint depre-

cated. De Roy W. Hubbard (Pediatrics, Jan. 15, '96).

The obturator nerve sends a little filament to the inner side of the knee-joint as well as to the hip-joint, and to this fact is due the characteristic pain in the knee which usually accompanies disease in the hip-joint, and which, in the great majority of cases, antedates the occurrence of pain in the joint itself. The obturator nerve often joins the long saphenous, which accounts for the fact that pain in the big toe is very frequently noted before pain in the knee, which, however, seems to have escaped the attention of a good many writers on this subject. Quite frequently children will be brought for observation because they limp and because they have complained of pain in the big toe, which the mother had supposed was due to some defect of the shoe or stocking or an ingrowing nail. Examination in these cases will frequently reveal the presence of hip-joint disease.

One of the first things which is present in inflammation of any joint is spasm of the muscles controlling the motions of that joint. In hip disease efforts have been made to draw inferences, on account of the preponderance of spasm in a particular group of muscles, as to the location of the disease in the joint, but so far without having put us in a position to diagnose with exactness the location of the focus of inflammation from the presence of spasm in certain groups of muscles. Not infrequently there may be noted, in addition to the spasm of the muscles immediately controlling the joint, spasm of the calf-muscles, although attention has very seldom been drawn to this fact. It often will be seen quite pronounced in the early stages of the disease, when deformity is very slight and limitation of movement in the hip-

joint but slightly marked. It will usually be found in those cases where pain in the great toe has been noted instead of pain in the knee.

Hand in hand with muscular spasm comes atrophy of the muscles affected by the spasm, and this atrophy shows itself too promptly to be attributed wholly to disuse, and seems to be dependent on impaired nutrition. It is one of the earliest and most important signs in connection with joint spasm in the diagnosis of incipient and doubtful cases, being of vastly more importance than the occurrence of pain; but usually it is not present until the disease has been in existence for some time.

The position assumed by patients with disease in the hip-joint varies according to the progress which the disease has made. At the outset the almost invariable rule is that the patient bears the weight of the body upon the sound leg, the toes of the affected side being turned slightly outward, the thigh being flexed, the leg everted and slightly abducted; the buttock on this side is decidedly flattened, and the gluteo-femoral crease lower down and more or less obliterated. On account of the abduction of the leg it seems longer than its fellow, but if accurate measurements be taken, with the limbs in the same relative position to the median line, this will be found to be an apparent, and not an actual, lengthening. As the disease advances this distortion becomes more and more marked, until the thigh may be flexed almost to the point of striking the chest, and the leg everted and abducted to the limit of possible motion. If the capsule has been greatly distended with fluid, it may spontaneously rupture, or some sudden movement may rupture it, and the leg may pass in a very short time from the position of extreme abduction and external

rotation, to one of adduction and internal rotation.* Quite frequently this change accompanying the rupture of the capsule is followed by marked relief from the pain of which the patient had previously complained. This position of adduction was formerly spoken of as the "third



Appearance at the outset. (*Sayre.*)

stage" of hip-joint disease, that of marked flexion and eversion being called the "second stage," while the former position of slight flexion was denominated the "first stage" of the disease. And for purposes of explanation, it possibly may be well to retain these terms in some cases, though they do not repre-

sent invariably the different stages in the progress of the disease, as we sometimes find cases with marked adduction in the commencement of the disease, though in such cases we usually find the leg is rotated outward instead of being rotated inward, as it is when the thigh passes from the position of extreme eversion and abduction to that of adduction.

Coincident with the change of position from abduction to adduction, there comes a change from apparent lengthening to apparent shortening of the limb. If the disease has been in existence some time, there may be actual diminution in the length of the leg from absorption of bone, as well as the apparent shortening due to the adducted position in which the limb is held.

Diagnosis.—The diagnosis in hip-joint disease should only be difficult in the early stages. If a child is brought, complaining of a limp, an obscure pain in the toe, calf, or knee, do not be satisfied with finding something in the toe, calf, or knee which may account for its limp and pain, because it may possibly have disease of the hip in addition to its other ailments; but strip it, and watch its position with great care, allowing it sufficient time to become composed and assume its natural attitude, as quite frequently, under the influence of excitement, slight disturbances of function may easily be masked. After noting any of the abnormalities of attitude which have been just described, place the child upon its back upon a hard surface,—a table covered with a shawl, for instance. It is important that the surface be not so thickly covered as to leave a yielding surface for the back to rest upon, as slight alterations in the position of the pelvis may then pass unobserved. With the normal child lying on its back, with its pelvis in such a position that a line

drawn from the centre of the sternum over the umbilicus through the symphysis pubis is at right angles to a line joining the two anterior superior spines of the ilia, the entire back should rest upon the table while the lower extremities are in a straight line with the trunk, and also rest upon the table. If there is any arching of the lumbar spine, raise both legs until the entire spine rests upon the table, and then lower the side which you

contact with the table, and a slight arching of the lumbar spine will result. This tilting of the pelvis does not necessarily mean the presence of hip-joint disease. It means a contraction of the ilio-psoas muscle, which may be caused by inflammation of the spine, by appendicitis, or by salpingitis; but the previous history of the last two affections would exclude them from consideration, while careful examination of the spine should clear up



Right hip-joint disease, showing position in which leg must be placed to make back lie flat on table.

believe to be the sound one until the back of the leg rests upon the table. If the joint of that side be unaffected, there will be no change in the position of the trunk and pelvis, and the spine will remain in contact with the table. Now lower the other leg gently to the table, and if there is involvement of the hip, the psoas and iliacus or rectus femoris muscles will be sufficiently contracted to tilt the pelvis before the leg comes in

the diagnosis between disease of the hip and disease of the spine, though in some cases both exist simultaneously, and the mistake of recognizing only one is sometimes made even by men of experience.

In investigating the condition of the patellar reflex in hip disease the writer found an increase of the reflex on the affected side, as compared with the sound side, and, in proportion as there was irritability of the joint with muscular spasm, so was there an increased patellar

reflex. In the differential diagnosis between hip disease and lumbar caries this symptom is of value, as in the latter disease the reflexes are much less apt to be exaggerated and the reflexes on both sides are equal. Brackett (*Boston Med. and Surg. Jour.*, Mar. 31, '92).

Both legs lying flat upon the table should then be moved to and fro, to ascertain, if possible, the presence or absence of muscular spasm.

It is frequently advised that an anæsthetic be administered, in order that the condition of a diseased joint may be thor-

oughly investigated. As far as diagnosis is concerned, this is absolutely unnecessary. The administration of the anæsthetic, by the removal of the sensitiveness from the joint, removes the necessity which Nature feels for establishing the involuntary muscular protection which she gives all inflamed joints, and thus removes from the surgeon a most valuable means of diagnosis. If the rigidity of the joint is due to adhesions, and so persists after the anæsthetic has been administered, the case has been of

such long standing that there should be no difficulty in reaching a diagnosis even by an inexperienced observer.

The mode in which to determine muscular spasm in the early stages of the disease, at which time it is most important to arrive at a correct diagnosis, is, first, to thoroughly gain control of the patient, and cause it to allow complete muscular relaxation, as a child will, in many instances, voluntarily stiffen its muscles when first examined, and thus mask the presence of a slight involuntary



Right hip-joint disease, showing tilting of pelvis.

oughly investigated. As far as diagnosis is concerned, this is absolutely unnecessary. The administration of the anæsthetic, by the removal of the sensitiveness from the joint, removes the necessity which Nature feels for establishing the involuntary muscular protection which she gives all inflamed joints, and thus removes from the surgeon a most valuable means of diagnosis. If the rigidity of the joint is due to adhesions, and so persists after the anæsthetic has been administered, the case has been of

spasm. The joints should then be moved through all normal ranges of motion, beginning with the sound side, and slight involuntary twitches taken into account. It is usually quite unnecessary to manipulate the joint so violently as to cause pain, in order to arrive at a correct diagnosis, and, in the majority of cases, pain will not be elicited unless very extensive movements are made, and unless the limitation of motion which Nature puts to the joint is violently overcome. Pressure over the

hip-joint proper may at times give rise to pain; it very frequently does, but in many cases pain cannot be so elicited.

The length of the two lower extremities should now be noted, the distance from the anterior spine of the ilium to the internal malleolus being taken as the most reliable measure; and in this connection care must be exercised that both extremities occupy the same relative position to the trunk at the time the measures are taken or they will be of no value, flexion and adduction causing much apparent shortening, while abduction causes apparent lengthening.

The relation of the trochanters to Nélaton's line should be noted, by passing a string from the anterior superior spine of the ilium to the tuberosity of the ischium. Normally this line should just touch the upper border of the great trochanter. If the latter lies above it, the cause may be fracture of the neck of the femur, congenital dislocation of the hip on the dorsum of the ilium, bending of the neck of the femur, absorption of the head or neck of the femur, or absorption of the upper part of the rim of the acetabulum, allowing the femur to glide upward; which cause is present in each case must be determined by the surgeon.

Atrophy of the muscles occurs early in joint disease, and the circumference of each thigh should be noted, both at the upper portion and also at a point lower down,—say, four inches above the knee,—care being taken to measure the thighs at corresponding points, or the results will be useless.

Literature of '96-'97-'98.

Atrophy of the limb coinciding with hypertrophy of the fold is one of the most important signs by which to recognize tuberculous osteo-arthritis before any other symptoms have appeared,

while the absence of these trophic troubles is conclusive evidence of the non-existence of a tuberculous lesion of the coxo-femoral articulation, even when it is indicated by other symptoms. Alexandroff (*Presse Méd.*, Dec. 9, '96).

In noting muscular spasm care must be had not to mistake the flaccidity of a paralyzed muscle for the normal state, and suppose the healthy side to be the seat of muscular spasm by contact. The fact that the more relaxed thigh was the smaller ought to clear up any possibility of error, and it would seem that it hardly required mention save for the fact that such mistakes have occurred.

The temperature and pulse should also be noted, any elevation of the former above normal being taken, in a doubtful case of every incipient disease, as conclusive proof that disease is present, especially if there is present in addition an accelerated pulse.

The amount of elevation of temperature is a fair index of the violence of the inflammatory process.

DISEASE IN THE SACRO-ILIAC joint should be differentiated from hip-joint disease primarily by the position which the patient assumes while standing, the body being sharply bent through the lumbar spine, away from the diseased side, in order to free the articulation from pressure. This position is typical of sacro-iliac disease, is not easy to describe, but, once seen, cannot be mistaken for anything else. Pressure of the two ilia toward each other gives rise to pain by compression of the diseased joint. Pain, in like manner, would be produced if pressure were made with the hands on the great trochanters, which might lead to doubt as to whether the disease were in the sacro-iliac or the hip-joint; but if the disease were in the hip-joint and the pain were caused by pressure with the hands on both trochanters,

pain would not be caused by pressing the ilia together with the hands behind the hip-joint, and the diagnosis would be cleared up in this manner. Direct pressure over the sacro-iliac joint also gives rise to pain, and rotation of the hip fails to produce muscular spasm.

CONGENITAL DISLOCATION of the hip may be mistaken for hip-joint disease, but the history is different: there is no history of traumatism, and there is usually no history of pain. The disturbance of gait has been noticed from the first efforts at walking, which generally have been made long after the time at which children ordinarily commence to walk, and there is usually marked prominence of the buttock on the side of the dislocation, and while the child is recumbent the head of the bone can be caused to glide upon the dorsum of the ilium, while the great trochanter is felt to approach and recede from the crest of the ilium. The only point in common with hip-joint disease is the limp, which, however, is different in its characteristics from the limp of hip disease, and the fact that the great trochanter is above Nélaton's line. In hip disease the trochanter would only be above Nélaton's line in an advanced case, whose history would be absolutely different from that of congenital dislocation of the hip.

Confusion may arise at times in regard to FRACTURES OF THE NECK OF THE FEMUR in small children where there is a history of traumatism, pain, and limping, but the diagnosis can usually be made by the fact that the disability and the pain immediately followed the traumatism, and the great trochanter was immediately found to be above Nélaton's line; the only confusion possible being in cases which do not come under observation for months after the occurrence of the symptoms and where no history can be ob-

tained. Such cases often present a picture of flexion and adduction which greatly resembles that of old hip-joint disease with absorption of the head of the femur.

In COXA VARA, caused by the bending of the neck of the femur, the diagnosis is more obscure. In these cases, also, the great trochanter may be above Nélaton's line. The motion of the joint may be limited, but careful investigation of the relation existing between the trochanter and the head of the femur, in combination with the direction of the neck of the femur to the shaft, and differentiation between the limitation of motion produced by spasm of the muscles and that caused by abnormal relations of the neck of the femur, which cause the latter to strike the ilium, will clear up the diagnosis.

The onset of coxa vara is insidious, pain, often felt chiefly in the knee, being the first symptom; then limping, with perhaps difficulty in kneeling and sitting. The pain is worst while the process is developing, but, while pain usually decreases, the joint-stiffness often increases progressively. Physical signs: Projection of the trochanteric region with a depression between great trochanter and glutei; thigh-muscles usually atrophied; abduction of hip always limited, with tendency to adduction. Where the downward bending of the neck is combined with a backward displacement and rotation of the head the signs are more marked. The limb is then rotated outward and adducted, while internal rotation and often flexion are impossible. The trochanter is above Nélaton's line in all cases. De Quervain (*Sem. Méd.*, Jan. 29, '98).

At times periostitis of the great trochanter may simulate quite closely hip disease, pressure over the trochanter giving rise to acute pain. If the head of the femur, however, be pressed into the acetabulum by one hand on the middle of

the thigh while the knee is abducted with the other, no pain is produced and the sensitive spot is thus located in the trochanter and not in the head of the femur.

The occurrence of tumors of the femur and ilium should not be overlooked. These are almost always sarcomata, and can usually be differentiated from tuberculosis or syphilis by the rapid enlargement of bone usually following quite soon after a traumatism associated with pain, which is usually caused by pressure on nerve-trunks and does not resemble in its characteristics the night-crises of ordinary hip-joint disease. Muscular spasm is also usually wanting. The importance of a correct diagnosis' being reached very early in such cases cannot be overestimated, as it is only by prompt amputation that life can be saved.

Case, aged 6½ years, in which there were a large abscess and symptoms of hip disease. The joint was incised, much pus was evacuated, and the capsular and round ligaments were found to have given way. The bone was only diseased to a small extent. The trouble mended slowly and then became stationary after four months. Sinuses had formed, which were opened. No necrosed bone found, but the inner portion of the upper third of the thigh was enlarged and there was an obscure sense of fluctuation. On firmly compressing the part a large mass of solid faecal matter was squeezed out. The mass, it is believed, was lying between the vastus internus and the adductors, and had been there for several weeks. The explanation is that the patient must have had an attack of typhilitis, and that there were perforation and pus leading through the obturator foramen, thus forming a track for the subsequent passages of faeces. The patient made a complete recovery. Henry G. Rawdon (*Liverpool Medico-Chir. Jour.*, July, '88).

A point to be borne in mind in making a diagnosis of abscess in connection

with a fluctuating swelling on the buttock is the possibility of confounding one with an aneurism, as there is on record a case of gluteal aneurism that was opened with fatal result under the impression that it was an abscess. It is always best to confirm the diagnosis by an aspiratory needle.

Etiology.—The ordinarily accepted type of "hip disease" or "morbus coxarius" is a tuberculosis, which in the vast majority of instances begins in the bone, though it may, in exceptional instances, commence with synovial membrane.

How the tubercle bacilli gain access to the bone is a matter which is still under discussion. It is probable that the bacilli are present in the circulation and that under the influence of a traumatism, not necessarily severe, a lowering of the resistance is produced in the neighborhood of the joint sufficient to favor the local development of bacilli which have been present in the general system for a long time, but which had not increased on account of lack of suitable conditions.

Hip-joint disease believed to be local tuberculous affection, due to accidental inoculation and not to a constitutional or strumous condition. The irritation of the peripheral extremities of the nerves in or about the joint produces muscular spasm, which, in turn, distorts the joint by trauma, aided by the bacilli of tuberculosis. Phelps (*N. Y. Med. Jour.*, Aug. 31, '89).

Tubercular material was injected by Müller into the femoral artery of animals with negative results. When injected into the crural artery from which the nutrient artery of the femur arises or into the nutrient artery itself, typical bone tuberculosis was set up.

Tubercular matter from phthisical lungs injected into animals' joints sets up tuberculous joint-disease, while injection of inorganic matter not contain-

ing tuberculous matter either into the joints or general condition does not cause tuberculosis.

Schüller rendered guinea-pigs and dogs tuberculous by inhaling solutions of tubercular material from diseased lungs and injected the same into the animals' lungs. The joints of these animals were then wrenched or bruised, which produced a typical chronic tubercular synovitis in a great proportion of the cases, while healthy animals whose joints were similarly treated suffered from only a temporary sprain.

The exanthemata are frequently followed by joint-tuberculosis—apparently on account of the lowering of the general vitality below the point where the tissues are capable of resisting the growth of the tubercle bacilli.

Pathology.—In the early stages of hip-joint disease there is an hyperæmia in the cancellous tissue about the epiphyses where the disease usually begins, in the centre of which a small gray tubercle appears.

The capillaries in the Haversian canals become blocked up with bacilli. An hyperæmia is kept up, the trabeculæ in the hyperæmic area are absorbed, enlarged bone-spaces are formed, and fatty degeneration of the bone-cells occurs.

The gray spot in the centre of the hyperæmic area increases in size, its centre begins to grow yellow; other similar spots occur and merge into each other; the centre breaks down and becomes a semisolid cheesy mass and may turn into pus.

The blood-vessels in the periphery of the inflamed area often become so blocked that the blood-supply is cut off, and necrosis of a larger or smaller part of the apophysis of the femur results. If all conditions are favorable, the focus may become absorbed or may become cal-

cified, or else as the focus of disease increases in size it may grow toward the surface of the femur, open outside the joint-cavity, and the case may run a comparatively short course with little or no destruction of the joint, or, as is more usual, it may break into the joint itself, setting up a purulent synovitis.

The synovial membrane becomes inflamed and thickened, the blood-vessels are engorged, an increased serous or sero-purulent effusion takes place, and the joint becomes filled with a gelatinous mass, the cartilage becomes eroded, and the bare ends of the bone come in contact.

If the process becomes less violent, on the contrary, the granulations become firmer and not so pale and gradually give place to fibrous tissue, adhesions forming between the joint-surfaces, scar-tissue taking the place of the granulations, and contraction of the capsule limiting motion on the joint.

When the focus of disease is in the ilium, the area of inflammation may advance toward the pelvis as well as toward the acetabulum, and in these cases the periosteum lining of the ilium on its inner side becomes much thickened. At times the entire bottom of the acetabulum may be absorbed and the head of the femur pass into the pelvis; at other times there is only a small hole through which pus passes to form an abscess which may burst into the bladder or rectum or burrow under the adductor tendons or out on the buttock. Even in this condition recovery is not impossible.

The size of the acetabulum is often increased by the progress of erosion and also by the action of reflex muscular spasm in crowding the head of the femur against the upper rim of the acetabulum. Cases having been reported in which the head of the bone lay inside the pelvis in



Comparison between tubercular and healthy hip-joints, showing absorption of the head and neck of the femur, rarefaction of the head, and absorption of the acetabulum. Normal side shows epiphysial cartilage below the head of the femur and cartilage in the acetabulum, where innominate bone has not yet ossified. Bandages and adhesive plasters shown on thigh of diseased side. (*Sayre.*)

spite of the limbs' having been kept parallel by plaster of Paris, which had prevented the occurrence of deformity.

The importance of this fact as bearing on the necessity of traction as well as fixation in the treatment of the disease should not be overlooked.

The erosion of the upper part of the acetabulum accounts for part of the shortening in some cases of hip disease. Retardation of growth may give actual shortening of the femur, and it is not unusual to find that the leg and foot of the affected side are also smaller than their fellows.

If the disease progresses sinuses may burrow from the joint in all directions both inside and outside the pelvis, and later on amyloid changes in the liver and kidneys will be set up or a tubercular meningitis or a general tuberculosis may set in.

Prognosis.—Prognosis in disease of the hip-joint varies very much, being largely determined by the amount of destruction which has taken place before the case comes under observation, the amount of recuperative force possessed by the patient, and the intelligence of home co-operation—the last, perhaps, being the most essential element.

Cases of syphilitic disease ought to give excellent results, if to local protection of the joint be added thorough, persistent antisyphilitic treatment.

Cases of acute traumatic synovitis, if seen at once, and given absolute and complete rest, almost always recover perfectly.

Cases of acute, infectious osteomyelitis demand prompt operation and removal of diseased foci. If this can be done before too much general systemic infection has taken place, prompt recovery usually follows.

In tubercular cases, seen early, recov-

ery, as a general thing, takes place. The time which a patient will have to wear a splint is very seldom under two years. If the patient is able to dispense with it inside of this time, it is remarkably fortunate, and the parent should not be led to anticipate such a result. The amount of shortening which may take place, and the amount of impairment of motion, cannot always be accurately determined beforehand, and it is very unsafe to make a definite prognosis. Cases may be seen at apparently the same time after the onset of the first symptoms, with apparently the same amount of disease, be treated in precisely similar manner, and while one recovers with an absolutely-perfect joint at the end of two years, the other may drag on a tedious course of four, five, or six years, and at the end of that time recover with decided shortening and marked diminution of motion. The only difference in the two cases apparently having been the personal equation of power to resist disease. What can be promised is that, if the patient's recuperative force is sufficient to allow it to recover at all, it can recover with a leg parallel with its fellow, and not flexed upon the trunk. And the parents may be told that the length of time during which a splint will probably have to be employed will not be less than two years.

Number of cases of hip disease observed which lasted a remarkably short time, though, when first seen, there was nothing to distinguish them from cases in which treatment had to be continued over years. Out of one hundred and fifty-six cases applying for treatment, thirteen made a rapid recovery and remained well. Eight of these seemed to have had a simple acute synovitis, but resembled true hip disease so closely that a diagnosis between the two was impossible.

In other cases there must have been an

ostitis, the cases recovering with shortening, thickening about the trochanter, and, in some cases, slightly-limited motion. Lovett and Morse (*Boston Med. and Surg. Jour.*, Aug. 18, '92).

The question of abscess also comes into the prognosis, and parents are frequently anxious to know whether or not a child will have an abscess. In many cases there is felt at the time of first examination a brawny, porky induration around the hip-joint, which is the forerunner of an abscess, or the child may be found with an inflamed, sensitive joint which absolutely precludes any possibility of motion, and in such cases it is quite probable that an abscess will develop more or less speedily. In other cases, where the patient is seen early, and the brawny induration is as yet not present, no definite prognosis can be given, though the percentage of cases that develop abscesses when thorough treatment is carried out from an early stage of disease is decidedly small.

Treatment.—The indications for treatment in disease of the hip-joint are, primarily, to give the joint physiological rest, and, secondarily, if the general condition of the patient demands special treatment, to counteract syphilis, rheumatism, and so forth, to take such measures as seem demanded.

To obtain rest of a joint like the hip is not easy. The Thomas hip-splint endeavors to secure it by fixing the trunk and lower extremity by means of an iron bar three-fourths of an inch by three-sixteenth of an inch and long enough to extend from the scapula to the lower third of the calf and fitted with cross-bars long enough to embrace three-fourths of the circumference of that part of the body where they are placed, namely: at the thorax, calf, and upper third of the thigh. The splint is padded with felt covered with leather and bent

to fit the contour of the body in its deformed position, and then bandaged firmly to it. In acute synovitis of the hip it is an excellent means of treatment, and in cases where no other form of treatment is practicable and capable of doing much good. The fixation which it gives the hip, however, does not counteract the reflex muscular spasm which in chronic joint-disease creates so much of the destruction which is seen in cases left to Nature, and which is capable, in cases which have been simply prevented from having flexion but not treated with traction, of causing perforation of the acetabulum.

Traction in the proper line and of sufficient amount to relieve involuntary muscular spasm and so lessen intra-articular pressure is the best agent we possess for relieving pain in chronic joint-disease and should always be added to any apparatus that is employed for securing fixation, as the latter, unless thus supplemented, but partially fulfills its mission.

Another objection to the Thomas splint is the method by which it straightens the deformity, which is effected by bending the splint backward by wrenches from time to time. If there is contraction of the flexor muscles, this proceeding must result in crowding the head of the bone violently against the acetabulum, thus running the risk of re-exciting inflammation.

In the majority of cases there is too much deformity when they first come under observation to permit the application of a splint. Such cases should be put to bed, a long padded side-splint, with a cross-bar at the bottom, should be firmly bandaged against the sound leg and the trunk as far as the axilla, and the body and leg thus secured may, if necessary, be fastened to the sides of the

bed for the purpose of retaining them in position.

It is sometimes found better to bandage the patient with Bradford's frame, a rectangle of iron gas-pipe somewhat longer and broader than the child, which has canvass stretched tightly across it except at the part where the hips lie, which is left open for a bed-pan. A long board should be placed under the mattress, as the ordinary spring-mattress is too yielding to allow proper control of an inflamed joint. Adhesive-plaster straps, furnished with buckles at one end, are next applied to the diseased limb, the buckles being just above the malleoli, and the plaster extending as high on the thigh as possible. Heavy extension diachylon plaster, spread on mole-skin, is best for this purpose, as the ordinary rubber plaster is irritating to many skins when worn for a long time, and is spread upon such thin cloth as to be incapable of enduring the strain necessary in many cases to afford relief. In applying the plaster it should be warmed but very little, and in many cases need not be warmed at all, but should be snugly bandaged to the skin, and well rubbed with the hand to secure coaptation of the plaster. This tight bandage may then be removed and replaced by one not so closely bound. Some prefer, in addition to the two side-straps of plaster, a spiral of plaster passing around the leg in both directions, which serves to hold the plaster more snugly in position. Properly-applied extension plasters should remain for several months without the necessity of change. To the buckles are now attached small leather straps, which are fastened to a cross-bar below the sole of the foot, from which cross-bar a stout cord extends over a pulley-wheel at the foot of the bed and supports a weight. The amount of

weight will vary in different cases, and should be that which experience shows gives the greatest amount of relief in the particular case, and may vary from two to fifteen pounds. The direction in which the traction is made should be determined by the deformity which is present in each particular case.

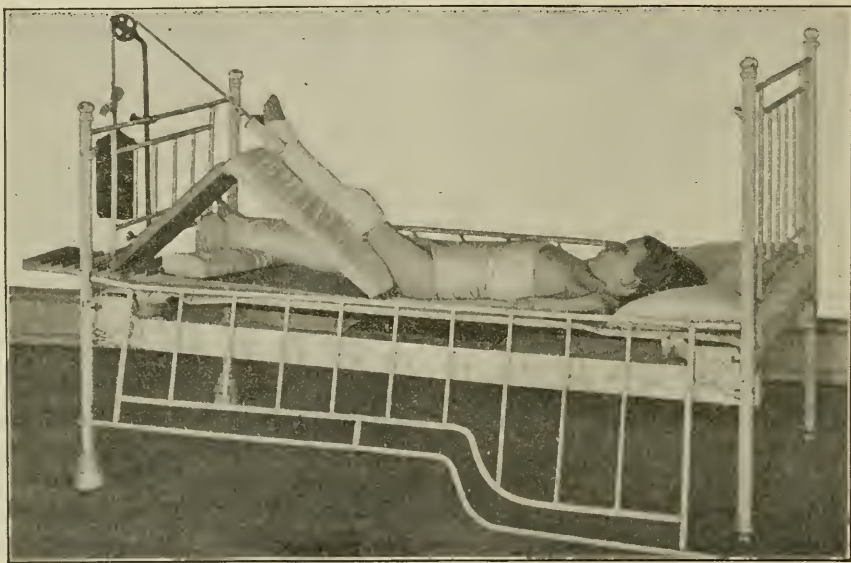
A really efficient apparatus for hip disease must afford traction outward as well as downward, so that the mean force exerted shall be in an axis with the neck of the femur, and thus relieve from pressure all the articulating surfaces of the joint. It must afford immobility and allow of unlimited out-of-door exercise, as far as pain or danger to the diseased joint is concerned. Wallace Blanchard (*Chicago Med. Jour. and Exam.*, June, '89).

When the body and sound leg are firmly bandaged to the side-splint, and the back is flat upon the bed, the diseased limb will assume a position either of abduction or adduction, combined with flexion, and in this position, whatever it may be, the line of traction must be made, and it must be made sufficiently great to give the patient freedom from pain. If traction, so applied, fails to relieve pain, and the position is that of adduction, a second line of traction may be made by passing a well-padded band around the thigh, close to the groin, and making traction outward at right angles to the long axis of the femur, over a pulley fastened to the side of the bed. The leg must be supported in its elevated position by pillows or by two boards hinged at one end and supplied with a prop, so as to make an inclined plane which can be raised or depressed according to the needs of the patient. If there is great tenderness behind the trochanter, a blister may be applied with great benefit.

In cases of *ostitis* of the trochanter with marked tenderness, relief can fre-

quently be obtained by plunging the sharp point of Paquelin's cautery deep into the bone, the skin over the trochanter having been injected with a drop or two of a 4-per-cent. solution of cocaine. In exceptional cases there may be an effusion in the joint of so great extent as to make aspiration advisable, but this is unusual. If the synovitis becomes purulent the joint must be incised and washed out with Thiersch or Labarraque solution. The line of traction is

this manner. And in such cases, where faithful trial of this method of reducing the deformity fails to give results, the patient should be anæsthetized and the joint forcibly straightened. If, at this time, it is found that there is so much contraction of the rectus muscle or the adductors as to prevent reduction of the deformity, except at the expense of violently crowding the head of the femur into the acetabulum, free section of the contracted tissues should be made be-



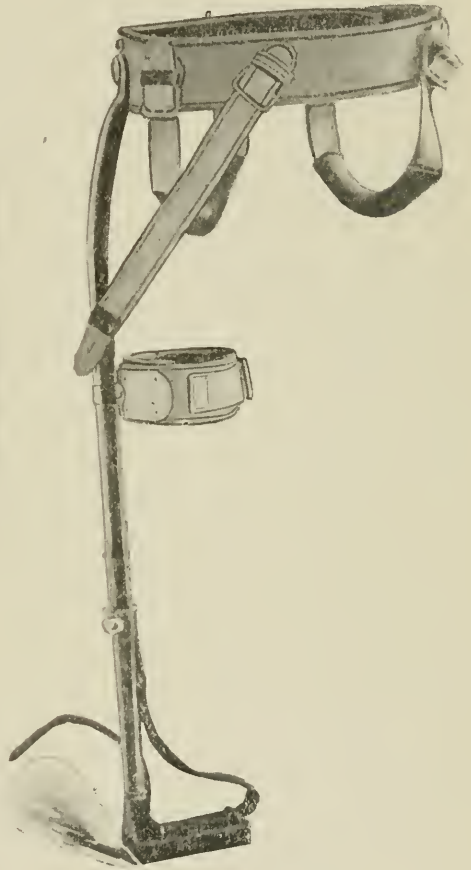
Extension apparatus.

to be changed little by little every few days, as the spasm of the muscles subsides, until the leg is gradually brought parallel to its fellow and flat in bed, without disturbing the position of the trunk and the sound leg. When the legs can be made parallel and rest on the bed without tilting the pelvis, a splint may be applied. In some cases the disease will have advanced so far at the time of first observation that adhesions will have formed around the joint too strong to permit reduction of the deformity in

fore reduction is attempted. The joint should then be immobilized either with a splint or with a plaster-of-Paris dressing extending from the ankle to the thorax, while weight-and-pulley traction is again resumed. If plaster of Paris is employed, it should be reinforced at the groin by a strip of iron to prevent crackling. When the deformity has been overcome and the joint is free from active inflammation, the patient may be allowed to rise when supplied with a suitable apparatus.

The object of the hip-splints now in use is twofold: First, to enable the patient to walk about easily without bearing weight upon the diseased joint, and, second, to prevent the joint from receiving the traumatism consequent upon ordinary motion. If the patient is very large and fat or the joint extremely sensitive, it will be found wise to use a pair of crutches in addition to the hip-splint, as the joint in this manner will be better protected and the patient freed from the galling sometimes occasioned by the pressure of the perineal straps in very heavy and fat patients. In the great majority of cases the apparatus most suitable for protecting the joint consists of a pelvis-belt with a bar running down the outer side of the leg to a point a couple of inches below the sole of the foot, where it joins a cross-bar, to which are attached two straps which serve to fasten the instrument to the buckles on the adhesive plaster. By means of a ratchet and key on the foot-piece which is attached to a notched bar sliding inside of the main bar, which is hollow, the splint may be made longer or shorter. Just above the knee a metal horseshoe-shaped collar holds the thigh in position. Two straps pass from the front of the pelvis-belt to the rear, between the legs, and serve to hold the pelvis-belt in position. The buckles to which these straps are attached should be near together in the front, to avoid pressure on the femoral vessels, and widely separated at the back in order that the pressure may come under the tuberosity of each ischium. An elastic strap runs from the middle of the back bar of the pelvis-belt to the side-rod to prevent the pelvis-belt from tipping up too far in the back. When applied the pelvis-belt is to be fastened sufficiently firm by the perineal straps to prevent it from rising higher than the

anterior superior spines of the ilia, while the foot-piece is buckled to the extension-straps, leaving two and a half to three inches between the sole of the foot and the top of the foot-piece. By means of the ratchet and key extension is then made until the patient is comfortable.



Sayre's long hip-splint.

As the splint projects below the level of the foot, an extra sole and heel must be added to the shoe of the opposite side, which should usually be about four inches high, and the splint should be so regulated that, when the proper amount of traction is made, the patient being upright, the length of the splint and the

length of the sound leg with the high shoe will be the same. The splint should be sufficiently long to prevent the patient from touching the foot to the floor, and, if the elevation on the opposite shoe is not high enough to compensate for this elongation, walking will be very uncomfortable. In the majority of cases a splint of this kind gives adequate protection and results in excellent cures. But if it is found that the parents do not fully understand the home management of the apparatus, or if the patient lives at a distance, so that it is seen at infrequent intervals, it may be wise to add to the splint a thorax-belt, which is joined to the pelvis-belt by means of a rod continuous with that passing down the side of the leg. This form of splint prevents the occurrence of flexion after the patient is allowed to walk, which sometimes takes place with the other splint if improperly applied, but it has the disadvantage of limiting the motions of the patient very materially, and being much more cumbersome. With the patients, however, who live at a distance, and where home co-operation is not intelligent, it is wise to employ it. The mistake must not be made of placing a joint in the bar that runs from the foot to the thorax-belt, as this will render the apparatus worthless. In some cases, also, instead of the perineal bands, it may be better to use a ring, as suggested by Dr. A. M. Phelps, for the latter cannot be tampered with by careless attendants, and, if it is fitted to the limb with proper care and sufficiently well padded, can be used with a fair degree of comfort. In adult cases where dependence can be placed upon intelligent co-operation of the patient, the use of the short traction-splint and crutches may be advisable. In this form of splint the side-rod terminates at the knee-joint and is joined

to a pair of hoop-shaped metal bars, which pass across the front of the femur and are supplied with two jaws on each side of the knee just above the condyles. Adhesive plasters are fastened to the thigh, terminating in broad, webbing bands, which are reversed over the jaws of the splint and fastened to buckles. By means of a ratchet and key traction on the joint is made in the same manner as in the case of the long splint.

Two cases of hip-joint disease cured with perfect motion, although in one case resection had been advised by an eminent surgeon as the only means of saving life. These cases were treated by traction without immobilization. The long, portable traction-splint was used, and the patients encouraged to walk as soon as it was securely applied. Traction was continued at all times, the apparatus being worn at night as well as in the day-time. Locally, compound iodine ointment was applied daily, either in the groin or behind the trochanter of the affected side. Constitutional treatment was employed throughout the entire course of the disease, compound syrup of hypophosphites being given in summer and codliver-oil in winter. J. K. Young (Univ. Med. Mag., Aug., '93).

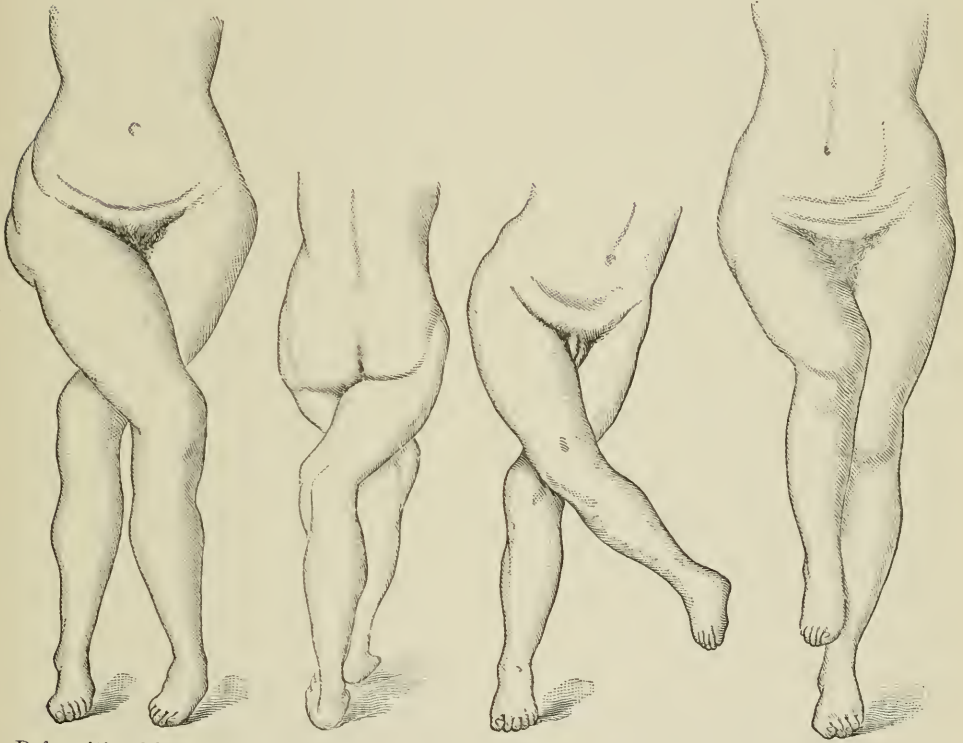
Statistics of 407 cases of morbus coxarius treated between 1859 and 1889, exclusive of exsections. Of these there were, in the first stage, 118; second stage, 119; third stage, 82; not mentioned, 88. Total number of cases, 407. Results: cured, motion perfect, 71; cured, motion good, 142; cured, motion limited, 83; cured, ankylosed, 5; unknown, 78; under treatment, 14; abandoned treatment, 3; discharged, 2. Died of exhaustion, 2; died of phthisis, 1; died of pneumonia, 1; died of tubercular meningitis, 5. Total deaths, 9. Total number of cases, 407.

Above cases in which the writer knows the result and the kind of splint worn, excluding cases under treatment. Cures with perfect motion: long splint, 19, or 21.59 per cent.; short splint, 54, or 28.12 per cent. Total, 73. Cures with good motion: long splint, 34, or 38.63 per

cent.; short splint, 86, or 44.79 per cent. Total, 120. Cures with limited motion: long splint, 29, or 32.95 per cent.; short splint, 49, or 25.52 per cent. Total, 78. Cures with ankylosis: long splint, 3, or 3.40 per cent.; short splint, 1, or 0.52 per cent. Total, 4. Deaths: long splint, 3, or 1.56 per cent.; short splint, 2, or 1.04 per cent. Total, 5. Treated with long splint, 88; treated with short splint, 192. Total number of cases, 280.

require. Cases in which both hips were involved were treated in the wire cuirass. Traction was regarded as vital to proper success. L. A. Sayre (*N. Y. Med. Jour.*, Apr. 30, '92).

Series of cases of deformity following diseases of the hip and due to insufficient care during treatment observed. The accompanying cuts illustrate some of these cases. L. H. Petit (*Gaz. des Hôp.*, Feb. 16, '95).



Deformities following hip-joint diseases due to insufficient care during treatment. (Petit.)

The mode of treatment had been rest in bed, with traction in the line of the deformity applied to the diseased leg, and occasionally traction in the axis of the neck of the femur, the sound side being bound to a long side-splint. Blisters were usually applied behind the trochanter major. When the deformity was reduced the patient was allowed to go about with the short traction-splint and crutches, or the long traction-splint, with or without crutches, as the case might

Literature of '96-'97-'98.

The ambulatory treatment in an early stage is extremely unsatisfactory, recumbency and complete rest giving better results.

A persistent high temperature, with no obvious cause in the early stages of hip-joint disease, indicates that the disease will run a rapid and destructive course, and is ominous of an unfavorable termination.

Under recumbency and fixation the temperature becomes, if not quite normal, at least constant. R. L. Swan (Med. Press and Circular, May 12, '96).

The treatment of abscesses occurring in tuberculous joints, is one which has been very widely discussed, and in regard to which there have been many different opinions. The prevailing trouble with many surgeons is that they fail to regard the abscess as an incident in the career of a tubercular joint, and treat it as a thing by itself, neglecting the bone-inflammation which was the original starting-point of the abscess. If it were possible to locate the focus or foci of disease and to remove all foci without doing great damage to surrounding healthy parts, the logical treatment of all tubercular inflammation would be the radical excision of all tubercular foci as soon as detected. This proceeding, indeed, became quite fashionable some years ago abroad, but experience has shown that better results are obtained by older and more conservative methods. If we cannot absolutely eradicate all tubercular foci, the chances of securing a good result are better by leaving them alone, provided they remain incapsulated and are not subjecting the patient to general systemic infection. Under rest and compression, good hygienic surroundings, and forced feeding many collections of tubercular matter disappear. If they come to the surface it is the best plan in many cases to disinfect the skin with great thoroughness, apply a sterilized dressing, and allow them to open spontaneously; wash the cavity thoroughly with peroxide of hydrogen or chlorinated soda (Labarraque's solution). Abscesses treated in this way rarely give rise to any disturbance and usually close in a few months.

In the tubercular hip-joint disease early and complete excision strongly

recommended. Arthur E. Barker (Brit. Med. Jour., Jan. 19, '89).

Tubercular abscesses in the course of hip-joint disease to be treated on true surgical principles: free incision, thorough curetting of the walls of the abscess-cavity while the wound is being flushed with plain boiled sterile water, and complete closure of the wound in the skin without drainage. W. J. Taylor (Annals of Surg., July, '95).

Literature of '96-'97-'98.

Treatment of hip-joint disease is fixation and traction. Excision of abscesses should be performed when they enlarge rapidly, are associated with great pain, are burrowing and producing pressure upon other important structures, or are attended with marked sepsis.

When an abscess appears upon the surface as a tumefaction merely, with no other evidence that it is an abscess than that it is associated with hip-joint disease, to excise and subject the patient to further danger of pyogenic infection would be anything but good treatment. S. L. McCurdy (Med. and Surg. Reporter, Feb. 8, '96).

If there has been a mixed infection grafted on top of the original tubercular focus, immediate operation with free incision of the abscess, complete removal of all *débris*, and thorough drainage should be employed. As a usual thing, the abscess has originated in the bone, and in the cavity will be found very frequently some crumbs of dead bone, although occasionally they are not present, while not infrequently, in cases opened at an advanced stage, the abscess seems to have been shut off from the original bone-focus, which has healed up after extruding its carious bone. Many cases pass on to abscess quite promptly, and, indeed, it sometimes seems as if those cases which supplicated early and ran an acute course got well in shorter time than those which were accompanied with less pain and less suppuration. The oc-

currence of abscess does not necessarily mean a less favorable result, and it is not unusual to see cases of double hip disease, one side having been the seat of an abscess and the other having been free from suppuration, in which the motion is better on the side where suppuration took place.

If great destruction of the head of the femur or the acetabulum are present when the case first comes under observation, or if, in spite of protection and good hygienic surroundings, the case does not do well and disintegration of the joint is progressing, the question of excision presents itself. And here again the difficult problem is when to operate and when not. The great majority of cases, seen in the early stages and properly treated, never reach the point of operation, except in the class of acute infectious osteomyelitis. And, again, there are other cases which come to the surgeon, with grave hectic symptoms, a hip full of burrowing sinuses, and a mass of dead bone inclosed in a thick involucrum, which have no chance for life except by the prompt removal of all diseased tissue and proper drainage.

[Number of cases of resections of the hip recovered with very good motion. One has almost perfect motion; can run, dance, skate, and walk many miles without the slightest fatigue, although more than 3 inches of his femur and much of his acetabulum were removed; yet he has only $\frac{3}{4}$ inch shortening of the limb. LEWIS A. SAYRE, Assoc. Ed., Annual, '90.]

Ultimate results in 66 cases of hip-joint excisions (by cure is meant that all sinuses have closed, and there is no symptom of trouble about the hip; by relieved, that sinuses are open): There were 32 children discharged cured, 25 died, 3 discharged relieved, 2 discharged not improved, and 4 in the hospital.

Of the cause of death, 14 died from amyloid degeneration, 1 from amyloid de-

generation and peritonitis, 2 from general tuberculosis, 1 from acute nephritis, 1 from septicæmia, 1 from heart-failure, 1 from coma (uræmic), 3 from meningitis, and 1 from exhaustion.

Of the patients discharged cured, the present condition of 23 is absolutely known: 1 is well 18 years after discharge; 1 well 11 years after discharge; 2 well 9 years after discharge; 1 well 7 years after discharge; 2 well 6 years after discharge; 1 well 5 years after discharge; 1 well 4 years after discharge; 1 well 3 years after discharge; 4 well 2 years after discharge; 9 well 1 year after discharge. Poor (N. Y. Med. Jour., Apr. 23, '92).

Preparation of a hip-joint on which the writer had performed resection some years before. It demonstrated that the end of the femur had made a good movable joint in the acetabulum. Not a bad functional result obtained in one hundred and fifty hip-joint resections. Schede (Deutsche med.-Zeit., May 22, '93).

Between these two extremes we find a third class, in which the surgeon at times is in doubt whether the continued use of a splint for a longer period of years is better, or whether a free removal of the head of the bone, scraping of the acetabulum, and removal of all tubercular tissue may not, in the end, give a better result. Such cases must be decided by each man on his own experience.

In case operation is decided upon, if the patient has a large abscess and is very much exhausted, it is usually better to open the abscess freely and wash it out at one sitting, and in a few days, when the patient has rallied from the removal of retained pus, to complete the clearing away of dead bone, except in cases presenting many old sinuses, where it sometimes is best to unite these by an incision. The best method of reaching the joint is by an incision starting midway between the anterior superior spine of the ilium and

the greater trochanter, and, passing over the great trochanter, down the thigh along its outer aspect. This incision should pass completely through the periosteum and extend to a point below the lesser trochanter. By means of a curved bistoury the periosteum should now be divided at right angles to the original cut and, by means of a periosteal elevator, peeled up from the femur. At the digital fossa it will be necessary to resort to the knife to divide the muscles inserted there. At all other points the periosteum can be peeled off by the periosteal elevator. The femur should be sawed just above the lesser trochanter, and the head removed from the socket by means of a pair of lion forceps, or may be dislocated from the acetabulum prior to sawing, at the pleasure of the operator. If there are evidences of disease farther down the shaft of the femur the periosteum must be split lower and the femur sawed in two lower down. The acetabulum should then be explored, and, if any foci of disease exist, they should be carefully removed with a sharp spoon. If the acetabulum is perforated, the opening must be enlarged so that no shoulder of bone shall cause pus to accumulate in the pelvis. Sometimes it is necessary to drain such intrapelvic abscesses through the sciatic notch instead of the acetabulum. If any sinuses exist, they should be carefully cleaned and all tubercular tissue removed as far as possible. The wound should then be thoroughly packed from the bottom with iodoform gauze and the patient placed in a wire cuirass. The wire cuirass consists of a wire frame-work extending from the head to the heels, with a pair of movable foot-pieces, which allow the legs to be lengthened or shortened. The sound leg and the trunk are firmly bandaged in position by a roller bandage.

Turns of the bandage also pass over cotton pads in the groin and around the handles of the cuirass and serve to give counter-traction. The diseased limb is then fastened to the foot-board of the cuirass by means of adhesive pieces extending to the thigh, as for the application of a hip-splint, and the foot-board is then drawn down until both legs are of the same length, the bandages just mentioned as passing between the legs keeping the trunk from slipping down. The patient can be dressed in his cuirass, which is cut away under the buttock for this purpose, with much less pain than in any other manner, and can have the benefit of out-door life from the time of operation, being transported in a wheeled carriage.

Simple method presented by which recumbency, with any advantage, can be obtained without the counter-balancing evils which attend it when used in the general way by confining a patient to bed. A light carriage with wicker-work sides, rubber tires, and well-tempered springs is made of a length suitable for the patient, allowing for at least three years' growth; and it is surprising how a child will grow on such a carriage in the fresh air and sunlight. Cut illustrates carriage as used by the author. W. W. Bremner (Med. Rec., Aug. 3, '95).

If a cuirass cannot be had a double Thomas hip-splint will answer the purpose if combined with traction by weight and pulley. The wound should be dressed as frequently as may be necessary to keep it clean, the packing gradually being removed as new bone regenerates from the inner surface of the periosteum, and in some cases Nature will form an artificial joint almost as perfect as its fellow, although this is not to be expected, and a certain amount of shortening and more or less disability usually result.

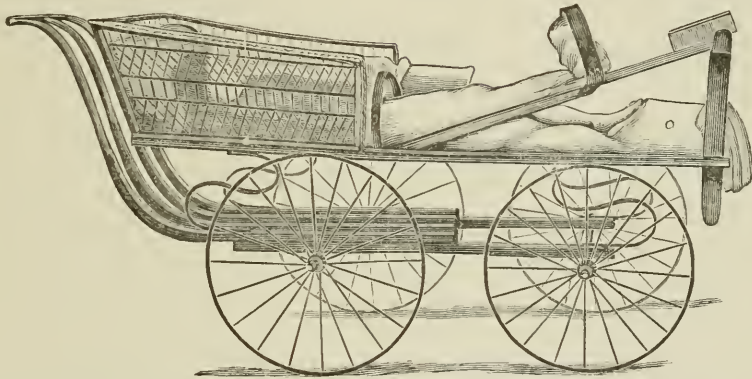
Cases of double hip disease must be

treated by rest in bed or by the use of the cuirass, as it is not possible to apply an apparatus which will allow them to walk in a convenient manner and still protect the joint.

In exceptional cases amputation at the hip-joint may be a necessity to save life, but this is most uncommon, recovery with a most excellent joint on which the patient walks well having been reported by Dr. J. C. Spencer after the removal of nine inches of femur.

In certain cases of malignant growths or tubercular invasions, which are not amenable to ordinary operative interference, the removal of the lower ex-

his index-finger and readily reached and compressed the common iliac artery. Entire absence of bleeding was readily maintained throughout the amputation which followed. The field of operation was free from bandage or appliances of any kind. The author recommends the procedure on account of its simplicity, its certainty, its aseptic character, and because it can be applied to cases which require that the deeper tissues should be severed at an unusually high level. In performing the amputations, it was found that this method of controlling the artery has the advantage that all the smaller arteries in the stump can be readily identified and ligatured, it being only necessary to lift the finger for a fraction of a second and so allow a mi-



Light carriage for cases in which recumbency is unavoidable. (*Bremner.*)

tremity, together with the ilium, at one operation recommended, disarticulating at the symphysis pubis and the sacro-iliac junction. Jaboulay (*Lyon Méd.*, Apr. 15, '94).

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Three consecutive successful amputations at the hip-joint, in which the following procedure was adopted. In the first place, as much blood as could be safely returned to the body from the limb to be amputated, by means of position or elastic bandage, was so returned. Then an incision was made through the abdominal wall about $1\frac{1}{2}$ inches internal to the anterior spine of the ilium. Through this incision an assistant passed

nute quantity of blood to escape. Charles McBurney (*Annals of Surg.*, May, '97).

If amputation is done, Fernaux Jordan's method should be employed.

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HODGKIN'S DISEASE. See LYMPHATIC SYSTEM, DISEASES OF.

HOMATROPINE.—When atropine or hyoscyamine is heated with baryta-water, the alkaloid is resolved into tropine (an artificial alkaloid) and tropic

acid. Tropine, mandelic acid, and dilute hydrochloric acid are then mixed, and a prolonged, gentle heat is applied; when the mixture is evaporated homatropine crystallizes out in deliquescent, colorless, regular, prismatic crystals. Homatropine is freely soluble in alcohol, ether, chloroform, and oil; more slowly in water. Its salts with hydrochloric, hydrobromic, and sulphuric acids are white and crystallize well. In therapeutic practice homatropine hydrobromate is most generally used. It occurs in small, white, lustrous, non-hygroscopic crystals, and is soluble in 10 parts of water. The solution is quite permanent. For internal use homatropine may be taken in doses of $\frac{1}{120}$ to $\frac{1}{60}$ grain.

Physiological Action.—The physiological action of homatropine closely resembles that of atropine. It dilates the pupil very rapidly and energetically, but the effect passes off in 36 to 48 hours. The mydriasis of atropine lasts for 10 to 14 days, and that of hyoscyamine for 8 to 9 days. Repeated instillations of homatropine solution (1 per cent.) causes a lowering of the pulse-rate, which is, however, only temporary. Slight hyperæmia of the conjunctiva almost invariably follows its use. Instillations of strong solutions (4 to 5 per cent.) induce a burning sensation on the conjunctiva, and, if in large amount, its bitter taste becomes perceptible, but without the dryness of the pharynx which follows the use of atropine. The action of homatropine on the circulation also differs from that of atropine in that the former lessens the pulse-rate and diminishes the arterial pressure. Unlike atropine, again, it does not, as atropine often does, superinduce cutaneous eruptions.

Poisoning by Homatropine.—No fatal cases of poisoning have been reported from the medicinal use of this remedy,

and no toxic symptoms beyond a slight drowsiness. This, no doubt, results from the fact that the use of homatropine is almost exclusively by instillation in ophthalmology. De Schweinitz and Hare, in experiments on frogs, have found that this drug in large doses first alters the respiration to the Cheyne-Stokes rhythm, then arrests it wholly; this is succeeded by a tetanic condition; and after that by a paralysis—leaving, however, the peripheral nerves and muscles untouched. The heart-movement is retarded and the pulse-rate diminished. Death occurs from respiratory paralysis.

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An undoubted instance of poisoning following the instillation of 1 drop of a 0.2-per-cent. solution of homatropine. C. A. Oliver (Amer. Jour. Med. Sci., Nov., '96).

Treatment of Poisoning by Homatropine.—The treatment of poisoning by this remedy is similar to that of atropine poisoning. The stomach, by emetics and the stomach-tube, is to be evacuated. Tannin and animal charcoal are then administered and emetics again given, followed by castor-oil. Artificial respiration, heat, stimulants, and hypodermics of strychnine are useful to support the respirations. Morphine may be given carefully as a physiological antidote.

Therapeutics.—Homatropine is almost exclusively used by ophthalmologists to dilate the pupils and paralyze the muscle of accommodation for the purpose of correcting anomalies of refraction in healthy eyes. For this purpose it is used in solution (4 grains to the ounce of distilled water), which is dropped into the eye every five or ten minutes until sufficient dilatation is obtained. For therapeutic uses in ophthalmology, atropine is generally used, although for incipient cataract

Risley prefers homatropine, especially where there is discomfort without increased ocular tension.

Homatropine is not a reliable cycloplegic in young subjects. Hansell (Amer. Jour. Ophth., No. 3, vol. xii).

Literature of '96-'97-'98.

Homatropine valuable as a cycloplegic. Drug to be applied at the upper border of the cornea, the patient looking strongly downward. A solution of 2 to 5 per cent. is used, four to six instillations being sufficient. The refraction should be determined within two hours of the last. Homatropine is not as reliable as other mydriatics when used by the patient at home.

Homatropine is a better drug than atropine for use in cases where complete rest of the accommodation is needed; because of its action being much shorter the eye returns to its normal accommodative power without passing through a long period of ciliary muscular weakness. The great advantage of homatropine is the brevity of its action.

Toxic symptoms from homatropine are almost unknown.

Homatropine is dangerous in cases where the tendency to glaucoma exists, as are all other mydriatics, but it is less dangerous than these.

Homatropine does not produce conjunctival irritation. Jackson (Jour. Amer. Med. Assoc., Nov. 21, '96).

As complete cycloplegia secured from 6 instillations of a 2-per-cent. solution of homatropine at 5-minute intervals as from a 1-per-cent. solution of atropine used 3 times daily for 2 days. F. Mayo (Med. News, June, '96).

Homatropine has been used against the night-sweats of phthisis, but other remedies are preferable.

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HUTCHINSON'S TEETH. See SYPHILIS.

HYDRACETIN.—This substance—known also as pyrocin (not to be confounded with pyridine), acetyl-phenylhydrozin, phenyl-acetyl-hydrazin, and phenacethydrazin—is produced by the reaction of phenylhydrazin with acetic anhydride. It occurs in hexagonal prisms or tablets of a silky lustre, without taste or odor. It is freely soluble in alcohol and chloroform and in 50 parts of water.

Physiological Action and Dose.—Wild has found that this substance is without effect on the voluntary muscles, while upon the heart-muscles in large amounts it acts as a depressant and lowers blood-pressure by a direct action on the vasomotor centre, and not by any action on the blood-vessel wall. It acts as a depressant upon the spinal cord, and lowering reflex action by its direct effects, and not by acting upon the nerve-trunks. It is a powerful antipyretic, analgesic, and antiparasitic, but an uncertain and dangerous one. The dose of hydraceticin should not exceed $\frac{1}{2}$ to 3 grains per diem, in divided doses.

Poisoning by Hydraceticin.—Given in repeated doses, hydraceticin has a cumulative effect, and produces jaundice due to commencing hæmoglobinæmia, with malaria, weakness, and a kind of angina. Less than 4 grains has produced cyanosis of the face and extremities, coldness of the latter, reduction of the temperature to 95° F., profuse sweats, acceleration and then retardation of the pulse, and an almost complete disappearance of the pulse and respiration. The urine becomes intensely dark red in color, and contains methæmoglobin, urobilin, and masses of amorphous, reddish-brown granules. The red corpuscles become discolored and show little tendency to form *rouleaux*. It is a powerful blood-poison, its distinctive action on the red

corpuscles being analogous to that of chlorate of potassium, pyrogallol, etc. Grave anæmia results, even from external use of this drug.

Treatment of Poisoning by Hydracetic.

—Acute poisoning calls for the use of cardiac and respirative stimulants, heat, respiration, and evacuation of the stomach. Chronic poisoning has been successfully treated by the free use of milk, followed by ferruginous and other tonic remedies.

Therapeutics.—Hydracetic has been used internally in rheumatic and other fevers, locomotor ataxia, and neuralgias. In a 10-per-cent. ointment it has been used in psoriasis.

The use of this remedy is attended with so much danger, and requires the exercise of such great caution, that its employment is strongly advised against, since it possesses no advantage over other remedies already in use. Further experiment with this drug should be abandoned.

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Philadelphia.

HYDRARGYRUM. See SYPHILIS.

HYDRARTHROSIS. See JOINTS.

HYDRASTIS.—Hydrastis, U. S. P., is the rhizome and rootlets of *Hydrastis Canadensis*, or golden seal. It is a small, perennial herb found in rich, moist woodlands throughout the United States, mostly in the northern and western portions. The dried herb has little odor and a peculiar, bitter taste. Hydrastis contains two principal alkaloids, hydrastine and berberine; a third alkaloid, xanthopuccine, is found in very small quantity. Although berberine is found in greater amount than hydrastine, the latter is the characteristic alkaloid. Ber-

berine is found in numerous other plants (*Berberis vulgaris* et al.).

Hydrastine crystallizes in white, four-sided rhombic prisms; it also occurs in an amorphous form. When pure it is almost tasteless, being very sparingly soluble in water, but freely soluble in alcohol, ether, chloroform, and benzin (benzole). It forms salts with the acid, which are acid and bitter.

Hydrastine is an artificial alkaloid produced from hydrastine by a process of oxidation. It also forms salts, one of which is official, the hydrochlorate (hydrastininæ hydrochloras, U. S. P.); this salt is soluble in water.

Berberine crystallizes in yellow needles which have a bitter taste. It is soluble in hot water and alcohol, but insoluble in ether.

Preparations and Doses.—Extract of hydrastis, fluid, $\frac{1}{2}$ to 2 drachms.

Glycerite of hydrastis.

Tincture of hydrastis, $\frac{1}{2}$ to 1 drachm.

Hydrastine hydrochlorate, $\frac{1}{12}$ to $\frac{1}{2}$ grain (maximum dose, 2 grains per diem in divided doses).

Berberine, $\frac{1}{2}$ to 15 grains.

Physiological Action.—Hydrastis, like other bitters, promotes the secretion of the saliva and gastric juice, and thereby increases the appetite and digestive power. It also increases the secretions of the intestinal glands and of the liver. On the nervous system hydrastis has effects similar to those of quinine, but less marked. Porak's experiments demonstrate that hydrastine is a heart-poison, acting on the vasomotor system centrally. It is, therefore, uncertain and dangerous. Its derivative hydrastine has no action on the heart, and but feeble action on the blood-pressure. It appears to act directly upon the capillaries, its vasoconstrictive power being greater and more permanent than that of

either hydrastine or ergot. Its action on the uterus is slight.

Hydrastine, intravenously injected in the proportion of $\frac{1}{64}$ grain for every 2 pounds of body-weight, produces constant diminution in the volume of kidneys. In doses of $\frac{1}{20}$ to $\frac{1}{60}$ grain for every 2 pounds of body-weight the blood-pressure increases: the pulse is also increased by small doses. Large amounts diminish both pressure and the frequency of the cardiac beat and increase the systolic contraction of the heart. Hydrastine, in small quantities, diminishes the caliber of the blood-vessels. The acceleration of pulse is attributed to excitation of the accelerator nerves of the heart; the subsequent slowing to stimulation of extracardiac centres of the pneumogastric nerves. Hydrastine stimulates spinal centres, followed by clonic and tetanic convulsions, and finally paralysis. The drug has a certain cumulative action, and is eliminated by the kidney particularly. No traces of it were found in the bile. Marfori (Gaz. Méd. de Paris, June 7, '90).

Poisoning by Hydrastis.—In poisonous doses hydrastis may cause convulsions, followed by paralysis, according to the quantity of the alkaloids present. Hydrastine is more convulsive in its effects than berberine. When injected into the jugular vein, hydrastine causes a primary fall of arterial pressure, succeeded by a decided rise, and the studies of Cerna have shown that it is an active poison, producing spinal convulsions, followed by paralysis (Hare). No fatal cases of poisoning by this drug have been reported.

Hydrastine is poisonous to both cold- and warm-blooded animals; hydrastine destroys the irritability of the muscular tissue; very large quantities produce loss of the functional activity of the efferent or sensory nerve-fibres, and also cause anæsthesia, when locally applied; in small amounts, it increases reflex activity by stimulating the spinal cord; later in the poisoning, by large quantities, hy-

drastine diminishes reflex action by stimulating, at first, Setschenow's centre in the medulla oblongata, and afterward abolishes it by paralyzing the spinal cord; the paralysis produced by the drug is due to an action upon the muscles, the motor nerves, and spinal cord; the convulsions of hydrastine are of spinal origin; hydrastine destroys the electro-excitability of the cardiac muscle; the alkaloid, in small doses, produces a primary frequency in the pulse-rate, due, probably, to a stimulating action on the cardiac motor ganglia; in moderate and poisonous amounts it diminishes the number and increases the size of the cardiac beats by an action upon the intracardiac ganglia and the heart-muscle itself; hydrastine lowers arterial pressure by a direct action on the heart, and also through a paralyzing influence exercised upon the centric vasomotor system; the drug produces at first an increase and afterward a decrease in the number of the respiratory movements; hydrastine kills by failure of the respiration; the alkaloid lowers bodily temperature, the drug increases peristalsis; in hydrastine poisoning the salivary and the biliary secretions are largely increased, especially the latter; hydrastine, locally applied, produces at first contraction of the pupil, afterward dilatation of the same. David Cerna (Therap. Gaz., May, '91).

Therapeutics.—Hydrastis is indicated whenever the tone of a mucous membrane is lowered in hæmorrhagic conditions and in malaria.

CATARRHAL DISORDERS.—We find it beneficial, as a rule, in subacute or chronic catarrhal troubles: in chronic gastro-intestinal catarrh, in catarrh of the duodenum and gall-ducts with subacute jaundice, in catarrh of the uterus and vagina with leucorrhœa, in catarrh of the bladder and urethra, chronic nasal catarrh, etc.

Not only does hydrastis possess decided tonic action, but it is also useful in all chronic, subacute, or catarrhal inflammations of those organs lined with

mucous membrane. W. C. Quincy (Chicago Med. Times, Nov. '91).

Inhalations of a solution of the extract 1 part, in salt water (3 parts), used with decided satisfaction in simple and tubercular bronchitis. Judson Palmer (Med. Age, No. 3, '91).

Literature of '96-'97-'98.

Good results obtained from use of fluid extract of hydrastis, in doses of 20 or 30 drops four times a day, in tuberculous subjects. The drug is superior to all others for phthisical cough. Sanger (Revue Inter. de Méd.; Revue Méd., Jan. 5, '98).

The conditions resulting from, or due to, the above are relieved by hydrastis: atonic dyspepsia, constipation due to deficient secretion, and spermatorrhœa.

MALARIA.—Hydrastis is an excellent remedy in the treatment of intermittent and in chronic malarial poisoning, when cinchona preparations cannot be obtained.

HÆMORRHAGE.—In the hæmorrhage of puberty and the menopause in hæmorrhage associated with lesions of the appendages, and in the uterine congestion of dysmenorrhœa, hydrastine hydrochlorate, in doses of 1 ½ grains per diem (in divided doses), will be found efficient. The fluid extract, in daily doses of 100 to 150 drops, given in divided doses, will arrest the hæmorrhages occurring during pregnancy and the puerperium.

Administered to 97 cases of uterine hæmorrhage from various causes, with complete or partial success in 47 of them. Recommended for preventing flooding of any kind. Hach (Proceedings Riga Society Med. Practitioners, '87).

Twenty minims of the fluid extract four times daily used for menorrhagia in a case of uterine fibroids. The bleeding was completely arrested, and in three months' time the patient menstruated regularly. J. M. Fuchs (Med. Press and Circular, Jan. 25, '88).

The drug is of especial value in hæmorrhages of the menopause, when there is no organic change in uterine tissues.

In cases of myoma the results were unsatisfactory. The tincture of hydrastine produced good effects in cases of atonic dyspepsia and general debility, commonly met with in women who have suffered from menorrhagia. Local use as important as internal administration; it has given excellent results in chronic endometritis, cervical erosions, and congestive states of the uterine cervix. It may be applied as a cervical dressing on the vaginal tampon, or added to the water used for the hot douche. H. M. Jones (Med. Press and Circular, June 25, '90).

Hydrastine is a heart-poison, acting on the vasomotor system centrally. It is an uncertain and dangerous remedy. Its derivative, hydrastinine, has no action on the heart, and its action on the blood-pressure is feeble. Its vasoconstrictive power is much greater and more permanent than that of either hydrastine or ergot. Its action on the uterus is very slight. When a vigorous contraction of the uterus is desired, ergot is to be selected. In the hæmorrhages of puberty and the menopause, in those accompanying lesions of the appendages, and in the uterine congestion of dysmenorrhœa hydrastinine is preferable. In the case of uterine fibroids and endometritis its action is only palliative. It is best to give frequent doses, continued for many days in succession. Its administration should be begun before the commencement of the expected menorrhagia. Porak (Bull. de la Soc. de Méd. Prat., Mar. 15, '92).

Hydrastinine given in eighty-six cases of uterine hæmorrhage, the form employed being ½-grain pills, 1 of which was ordered three times a day. The treatment was well borne, but patients frequently complained of painful uterine contractions. The most constant and remarkable effects were observed in hæmorrhage due to retro-uterine hæmatocele, an immediate arrest of hæmorrhage being obtained in all the five cases of this character. In functional menorrhagia considerable success was obtained; here

2 pills daily were ordered a day or two before the expected period, 3 being taken as soon as it commenced and continued until its cessation. In hæmorrhage after abortion hydrastinine was usually efficacious, as also in cases due to lesions of the appendages. It was of far less benefit in hæmorrhage due to chronic endometritis, to commencing abortion, and to uterine fibromata, though in all these classes of cases it sometimes proved useful. With hæmorrhages due to malignant disease no effect at all could be traced. Kallmorgen (*Lancet*, June 16, '94).

In obstetrical cases hydrastis is dangerous neither to the mother nor the child. It exercises a curative and prophylactic hæmostatic action on the uterus during pregnancy and at the time of accouchement. The fluid extract recommended in the hæmorrhages during pregnancy and during the puerperal period, in amounts of from 100 to 150 drops per diem, divided into five doses; as an immediate curative agent in hæmorrhage during accouchement, given to the extent of from 150 to 200 drops, in three or four divided doses; at the beginning of labor-pains in cases of placenta prævia; during dilatation, and in other cases; and, finally, as prophylactic measure against the frequent uterine hæmorrhages occurring at delivery or post-partum in cases of hydramnion, uterine inertia, and excessive development of the fœtus and its membranes, or as the result of a profound anæmia of the patient or of the predisposition to flooding persisting from previous labors. Bossi (*Nouveller Arch. d'Obstét. et de Gynéc.*, '91).

Hydrastine has no influence upon the physiological loss of blood during and immediately after labor; it has no influence upon the evolution of the uterus; it lessens the frequency and intensity of the pains, especially in multiparæ; it does not arrest puerperal hæmorrhage; and it exerts no influence upon the expulsion of clots from the uterus. Luigi Borde (*Bull. delle Scienze Mediche*, Dec., '92).

Hydrastinine is distinctly more powerful than ergot; the arrest of hæmorrhage

is prompt. The alkaloid is a powerful ecboic. H. C. Wood (*University Med. Mag.*, Aug., '94).

Fluid extract of hydrastis, 20 to 30 drops, repeated several times daily, recommended in cases of hæmoptysis. Koeniger (*Ther. Monats.*, No. 11, '88).

Drug found useless in the hæmoptysis of phthisis. Krannhals (*Proceedings Riga Society Med. Practitioners*, '87).

Hydrastis found of service in the treatment of the night-sweats of a large number of cases of hæmoptysis. The dose employed was 30 minims of the fluid extract. Cruse (*Cincinnati Lancet-Clinic*, Oct. 3, '91).

Ten-drop doses of hydrastis *Canadensis* given in water every two or three hours is a sovereign preventive of epistaxis. Kohn (*Med. Record*, June 9, '94).

Literature of '96-'97-'98.

In tuberculous hæmorrhages hydrastis is the best pulmonary hæmostatic. Hæmorrhages of dysentery have been completely suppressed with this drug after all other measures had failed.

Attention particularly called to the favorable and almost invariable effect that hydrastis exercises on hæmorrhoids, whether internal or external. Strangulated or irreducible hæmorrhoids are reduced with greatest facility.

As an oxytocic, it is not so rapid in its action as quinine.

It is the preferable remedy in the hæmorrhages of fibromyomas, and is the best means of combating the hæmorrhages of pregnancy at any stage, provided it is taken at sufficiently prolonged intervals—that is, 20 drops every three hours, or four times a day. Mariani (*Indépendance Méd.*, Apr. 17, '98).

The rationale of the hæmostatic influence of hydrastis has been explained above; hence, when uterine contraction is desired, ergot is to be preferred, as hydrastis does not act on the muscular fibre of the organs, but on the vasoconstrictors.

Woman seen in the fourth month of pregnancy in whom abortion took place

on the third day of treatment with 100 drops of the tincture daily, given for severe cervical catarrh. Von Styrk (Proceedings Riga Society Med. Practitioners, '87).

An aqueous extract of hydrastis Canadensis, taken even in large quantity, produces no toxic effect in warm-blooded animals. It produces always a reduction of the blood-pressure without any preliminary increase. It always produces in rabbits contractions of the uterine body and horns. Under the influence of hydrastis Canadensis the uterine contractions are most intense in cases of advanced pregnancy or soon after delivery, while the most feeble contractions occur in a virgin uterus after its use. Large quantities of this extract may produce premature delivery in the second half of pregnancy. Givopiszew (Bull. Gén. de Thé., Nov. 8, '88).

Small doses of hydrastine— $\frac{1}{40}$ to $\frac{1}{25}$ grain per $2\frac{1}{2}$ pounds' weight of the animal—are sufficient to bring on uterine contraction. The action upon the uterus is different from that of ergot, in that it is of central origin. K. Serdzew ("Das Pharmakologische Verhältniss des Hydrastins zum Blutgefässsystem und zum Uterus," '90).

Power of hydrastine to cause uterine contraction denied. P. Baumm (Ther. Monats., No. 12, '91).

Abortion can be produced—not only at term, but also in the middle of conception—in rabbits, mice, and dogs by the use of hydrastine. P. Archangelski (Meditzinskoje Obozrenije, p. 52, '91).

TOPICAL APPLICATION.—In stomatitis and follicular pharyngitis the glycerite of hydrastis or the fluid extract will prove an active remedial agent.

Fluid extract of hydrastis Canadensis used as topical application in pharyngitis, with or without enlarged tonsils, with favorable results. A. Felsenburg (Wiener med. Blätter, Nov. 29, '88).

Literature of '96-'97-'98.

In pruritus of the genitalia suppositories containing codeine or opium and hyoscyamus at night will often give the

patient relief. H. Robb (Ther. Gaz., Sept. 15, '96).

Unhealthy and sloughing sores, old ulcers, sloughing cancerous growths, and chancroids are favorably influenced when dressings of hydrastis are employed.

C. SUMNER WITHERSTINE,
Philadelphia.

HYDROCELE. See TESTICLES.

HYDROCEPHALUS.

Definition.—Hydrocephalus means an accumulation of serous fluid within the cranial cavity. The condition is frequently spoken of as dropsy of the brain, or as "water on the brain," and may occur as an acute or chronic affection. The location of the fluid varies, but is more frequently found within the cerebral ventricles than outside the brain or between its membranes.

Varieties.—The term "internal hydrocephalus" is applied expressly to chronic hydrocephalus usually congenital in origin, and when the word *hydrocephalus* is used without qualification it is this variety of the disease which is universally meant. Hydrocephalus may be *primary*, or *secondary* to some other disease.

Acute hydrocephalus is nearly always secondary to basilar meningitis, while chronic hydrocephalus is more frequently primary, and very often congenital; it also often develops after birth without any apparent antecedent cause. Hydrocephalus has also frequently been classified as congenital and acquired; but since many of the cases, apparently beginning after birth, really owe their origin to the same obscure causes which determine the congenital cases, it would seem better to regard the condition as *acute* or *chronic*, and as *primary* or *secondary*.

I. Acute Hydrocephalus.

Definition.—Acute hydrocephalus means an effusion into the ventricles or within the membranes of the brain, as the result of an inflammation of the pia mater usually, either simple or tubercular, or it may result from other intracranial or systemic organic disease.

Symptoms.—The symptoms of acute hydrocephalus necessarily depend for their mode of development on the cause producing the effusion, and, as meningitis of some grade is the most frequent cause, the signs of this disease very often precede and accompany those dependent upon the intracranial effusion. In other cases arising from gradual mechanical obstructions to the return venous circulation, the onset of symptoms indicative of ventricular dropsy may be most difficult to determine; so that, especially if other serious illness—such as summer diarrhœa of infancy or one of the specific fevers—complicate the case, the diagnosis may be conjectural or even impossible. In such cases the meningeal affection sometimes runs a subacute course and gradually subsides, leaving an effusion which may, in rare cases, be absorbed again, but which more usually tends either to remain stationary or to slowly increase in amount until the characteristic physiognomy of the hydrocephalic head is developed, and more or less permanent injury to the brain results, although such patients may survive for years in fair health.

Commonly, however, the signs of acute hydrocephalus appear during the course of one or other of the conditions to be referred to under etiology. When the primary disease is acute non-tubercular basal meningitis, the child stricken with this disease is apt to be fretful, irritable, restless, and sleepless, for from a few days to a week or two. Headache is

another early symptom, and is usually combined with intolerance of a bright light, while the face is flushed and the anterior fontanelle pulsates strongly. At this early period there may also be strabismus of irregular degree. Vomiting is frequently an early symptom, and may be an extremely marked one. The temperature is that of moderate fever, but in severe cases there may be hyperpyrexia during the first two or three days or even longer. The pulse is in some cases distinctly slow and rather full, but in others much accelerated in rate and small in volume, or these conditions of the pulse may vary or alternate. The respiration is often shallow and irregular, and, after actual ventricular effusion has occurred in sufficient amount to cause compression of the brain, Cheyne-Stokes respiration is frequently noted, especially in the later stages of the disease. According to the severity of the cause producing the effusion coma develops slowly or suddenly, with twitchings and rigidity of a limb, or of all the limbs. This tremor and stiffness of the muscles may include the neck and spinal muscles, and twitching movements of the facial muscles or of the head are very common. In the rapidly-fatal cases the coma deepens, the pulse and respiration progressively fail. The face is void of expression, the eyes present marked contraction of the pupils, with occasional irregular movements of the ocular muscles, convulsions may occur and be repeated many times, and the little patient dies from failure of the respiration and of the heart's action.

In some of these severe cases, inflammatory in nature, there is often a marked remission of all symptoms, including the regaining of consciousness, a lessening of the spastic condition of the muscles, and a decided improvement of the gen-

eral condition. This change for the better is too often a deceptive one, and is followed by a return of the same grave symptoms noted above preceding death. In cases of simple non-tubercular basilar meningitis the improvement may be real and the patient slowly recover, and after some months the recovery may be a perfect one. It is more common, however, that some permanent mental or physical defect is left as the result of the effusion, and such patients are a long time in recovering from the very marked emaciation which always is present and in some cases is extreme.

The course of the disease may be extremely variable, and the duration from a few days to many months. In such cases the characteristic hydrocephalic head may develop, and the case very much resemble one of chronic hydrocephalus. This variability in this disease we must assume to be directly dependent upon the grade and extent of the primary inflammation, which in certain cases runs a subacute or almost chronic course which may finally end in more or less perfect recovery. Even in the most favorable case, when effusion has taken place into the ventricles, it is extremely rare that this effusion wholly disappears. The clinical and post-mortem evidence is strongly in favor of the view that when effusion once occurs it is, at best, only permanently limited in the favorable cases, the brain gradually accustoming itself to the changed conditions, while the majority of the cases show a tendency toward progressive increase of the ventricular accumulation.

When tubercular meningitis is the primary condition, the same prodromal symptoms are usually noticed as have been above noted as ushering in non-tubercular meningitis. At times the onset is very acute, but it is more apt to be

gradual, with slowly-rising temperature, which does not commonly run so high as the temperature-curve of typhoid fever, nor does it often exhibit the very marked remittency usually observed in that disease. Irregularity of the pulse, some changes in the respiration-rhythm, retraction of the abdomen, irregularly-contracted pupils, slow and irregular lateral movements of the eyeballs and unilateral or bilateral flushing of the face, the *tache méningique*, gradually develop. A violent convulsion, followed by hemiplegia with involvement of the face, may be the next symptom, and it may or may not be preceded by twitchings of the facial and orbital muscles. In many cases amaurosis, ptosis, strabismus, or facial paralysis alone may be noticed after a convulsion. Drowsiness may be present from the beginning of the illness, but coma comes on early or late, according to the severity of the case, and the clinical picture is one of coma slowly ending in death.

The symptoms attending the course of other conditions producing acute hydrocephalus, and non-inflammatory in nature, naturally depend upon the nature of the obstruction to the venous circulation and the manner of its occurrence. In cases arising from enlargement of the bronchial glands the cerebral effusion may accumulate very slowly and be unsuspected until the case is far advanced, when prominence of the fontanelles with absence of pulsation, some increase in the size of the cranium, coupled with gradual on-coming stupor, tremors, convulsive seizures, or some form of paralysis may direct attention to the cerebral condition. The clinical course of these cases, which are fortunately of rare occurrence, is extremely variable, and the same may be said of the symptoms presented before actual dropsy of the ven-

tricles occurs, and evidences of intracerebral pressure become manifest, so that such forms of the disease, while they may develop acutely, approach very closely and often run into chronic hydrocephalus. In all cases of acute hydrocephalus the changes in the shape and size of the skull may be very slight, and if the disease occurs after the ossification of the cranial bones, such changes cannot be detected by measurements.

Etiology.—Any cause which operates by obstructing the venous circulation within the cranial cavity may cause an acute effusion of serum into the ventricles or elsewhere within the skull. Thus, intracranial tumors, enlarged bronchial glands, retropharyngeal abscess, and intracranial hæmorrhage are all causes of more or less acute hydrocephalus.

Literature of '96-'97-'98.

Adult internal hydrocephalus, apart from acute meningitis, is almost always due to subtentorial tumor, and is, indeed, a very common consequence of such a tumor. The tumor causes the hydrocephalus by (*a*) compressing the veins of Galen, (*b*) compressing the outlet from the lateral ventricles, or (*c*) compressing both. William Gordon (*Lancet*, Jan. 9, '97).

The same is true of certain diseases which cause, at times, enlargement of the bronchial glands, and thus, by pressure on the venæ innominatæ, obstruct the venous circulation of the brain, resulting in passive congestion and effusion of serum from the engorged blood-vessels. Acute hydrocephalus has also been frequently noted in connection with exhausting diseases, like severe cases of scarlet fever, typhoid fever, and prolonged diarrhœa of children, especially that occurring in summer.

Literature of '96-'97-'98.

Two cases, in children, of very marked hydrocephalus, with convulsions, spasmodic rigidity of limbs, exaggerated knee-jerks, and total blindness. Gastro-intestinal disturbance was in each case the starting-point of the affection. Marfan (*Sem. Méd.*, Aug 21, '96).

In the latter class of cases the effusion is partly the result of the actual wasting of the brain, which favors passive congestion of the organ, and is also due, in part, to the great weakness of the circulation, which is a special feature of protracted cases of infantile summer diarrhœa. Syphilitic meningitis may also be accompanied by an acute effusion into the ventricles, and in all of these cases a careful study of the family history, and a very critical examination of the patient, should be made so as to discover, if possible, other evidences of the existence of syphilis. Finally, certain writers have reported cases of so-called essential dropsy of the brain, in which there could be found no anatomical lesion to explain the effusion. No case of acute effusion within the cranium should, however, be put into the last category, unless a careful and complete post-mortem fails utterly to reveal a pathological lesion, and the diagnosis of acute essential dropsy during life is certainly a wholly impossible one. Practically acute intracranial effusion of serum is more frequently seen as the result of tubercular or simple leptomeningitis than from the other conditions above enumerated. (Acute hydrocephalus and tubercular meningitis are often used as synonymous terms, but, in view of the many other conditions which occasionally give rise to the former, it would be well to discontinue such use of these terms as misleading to students.)

Occasionally intracerebral hæmor-

rhage may result in the formation of a cystic accumulation of serum within the membranes of the brain or between them and the skull itself. Pachymeningitis may also cause a localized collection of serum. In such cases of localized cystic collections there is very apt to be marked pressure thereby of the subjacent convolutions. The amount of fluid present in any case of acute hydrocephalus is very small in comparison with the very large amount usually present in chronic hydrocephalus, and very rarely exceeds four or five ounces. When acute hydrocephalus arises from inflammatory disease of the membranes of the brain, the meningitis is commonly basilar. This is particularly true of the simple and tubercular meningitis of children, while cases occurring in adult life frequently involve the membranes over the convexity of the brain as well. Leptomeningitis as a cause of acute ventricular effusion is most frequent before the end of the sixth year, and more often arises in subjects debilitated by previous disease, or by poor hygienic and social conditions.

Pathology. — Post-mortem examination of the brain in acute hydrocephalus of inflammatory origin reveals usually a basilar leptomeningitis, which may be simple, tubercular, infective, or syphilitic in origin, with an excess of fluid in the ventricles, causing a marked dilatation of them, while the substance of the hemispheres presents appearances due largely to the increased intracranial pressure. This intracranial tension often partly expels the blood from the vessels, especially during the last hours of life; so that at the post-mortem the brain-substance may look anæmic, especially over the vertex and throughout the substance of the hemispheres. In cases of simple leptomeningitis the naked-eye appearances of the pia at the base of the

brain will rarely present marked evidences of the intense hyperæmia existing during life. The ventricles are distended with a slightly-opaque or turbid serum, while the choroid plexus is over-distended with blood, which may also be extravasated in punctiform patches in their immediate vicinity. The microscope shows extravasation of leucocytes along the lines of the blood-vessels and distending the perivascular sheaths, and also reveals minute capillary hæmorrhages, pus-cells, and in some cases compound granule-cells, depending largely upon the duration of the disease. The cerebral substance in some cases may contain areas of softening, but the rule is to find no such lesions, and, with the exception of changes in shape from pressure, the convolutions may be normal.

When tuberculosis is present it is usually also at the base in children, but may involve large areas of the pia mater in older subjects, and in adults the vertex is not infrequently the site of the tuberculous deposit. The characteristic post-mortem appearance is the tubercle, and the location in which this is most commonly found is in the pia overlying the crura cerebri, the optic, olfactory, and the point of exit of the third nerve, and also in the membrane as it extends over the corpora quadrigemini. The pia is much thickened, is covered by a grayish-white exudate, and the tubercles show as whitish-gray bodies imbedded in the membrane. In size the tubercles vary from exceedingly-minute bodies, hardly discernible macroscopically, to that of the head of a pin or even somewhat larger. The ventricles are distended with a turbid albuminous fluid, and there is thickening and softening of the ependyma. The microscope confirms the diagnosis and reveals the existence of

numerous obstructions of the smaller arterioles from tubercular deposit, or an obliterating endarteritis. Giant cells may be seen in the perivascular spaces or in the cerebral substance, while the bacillus tuberculosis is seen along the lines of the vessels and in and around the areas of the tubercular deposits. In all cases the bronchial glands should also be examined, since they are frequently a most important factor in the production of the ventricular effusion.

Diagnosis.—The diagnosis of acute hydrocephalus is not difficult when it occurs as the result of meningitis. In such cases the prolonged coma, the irregular movements of the muscular system, with the respiratory rhythm, are all suggestions of the increased intracranial tension due to the ventricular effusion. The subacute cases are, perhaps, the most difficult of recognition, and the condition of the brain may remain unsuspected until the graver symptoms appear. The cases arising rather abruptly from the pressure of intracranial growths or from enlarged bronchial glands also present many difficulties in the way of early diagnosis, but the appearance of grave signs of cerebral disturbance, the discovery in certain cases of other evidences of tuberculosis, or of retropharyngeal abscess causing embarrassment to the cerebral circulation, the exclusion of traumatism, the ophthalmoscopical examination, and a careful study of the history of the illness will often aid in making up an opinion. The very fatal cases which occur in large cities, especially during the course of the diarrhœal diseases of infants and young children, present few difficulties in their recognition, because the brain-symptoms develop so early and progress so rapidly toward death. In these cases the tendency toward a marked, but most deceptive, re-

mission of symptoms should be borne in mind. In all cases of acute hydrocephalus the general wasting of the body is a prominent feature. In cases of long duration the emaciation may become extreme, and contractions occur in the limbs which may be more or less permanent should recovery take place. The characteristic hydrocephalic aspect is rarely seen in acute hydrocephalus, unless the case should drift into the chronic condition, cases of which are only rarely seen. Cases arising from meningeal hæmorrhage usually become chronic, the fluid being encysted between the membranes of the brain.

Prognosis.—The prognosis of acute hydrocephalus is always bad. The disease ends usually in death, or in permanent mental or physical defects, in the cases which escape death. Probably the syphilitic form is the most hopeful when the condition is suspected early enough to get the patient promptly under the influence of specific remedies. The cases arising from enterocolitis, or any of the acute fevers or other exhausting disease, offer little hope as to recovery, although occasionally a patient will recover. The tuberculous cases are absolutely hopeless, although Jacobi and others have testified to the recovery of two or three cases. Subacute basilar meningitis may cause ventricular effusion and subside, leaving the effusion, which may remain stationary in amount or even lessen in amount so that the symptoms of its presence disappear; but usually the tendency is for it to increase, and finally, after months or years, the clinical picture of chronic hydrocephalus is produced, should the patient have been a young child, thus admitting of the expansion of the cranium.

Treatment.—The treatment of acute hydrocephalus is very often that of the

primary disease to which the ventricular effusion is only secondary. Sometimes, from the very rapid progress of the case toward a fatal end, treatment can be of little avail. In the majority of cases it is almost hopeless, but in all cases every effort should be made, for occasionally the recovery of one of these cases from a seemingly-hopeless condition will amply repay the untiring care which they all demand.

When the initial symptoms of meningeal irritation appear, should the patient be seen at that early period, absolute rest in a darkened room, prompt vesication behind the ears with cantharidal collodion, in children, and regular doses of calomel in great amount should be instituted. If necessary, opium should be given to control the restlessness, preferably combined with chloral, and these should be continued in suitable doses so long as the twitchings and spastic muscular condition continue. Irrigation of the bowels should be practiced where there is enterocolitis as the cause.

In all cases every part and organ of the body should be very carefully examined so as to exclude complicating conditions and establish the diagnosis. The initial treatment is of the greatest importance, for after the effusion has occurred there is less hope of doing good.

When the patient is a sthenic subject and the arterial tension high, leeches or wet cups to the mastoid regions may be employed. After these measures the spinal ice-bag should be used in the cases with high temperature; and they should be avoided in those with low-temperature range, as collapse has been induced in such patients in my own experience. The bromides and chloral will usually be demanded to mitigate the tendency toward convulsions, while they both tend to lessen cerebral hyperæmia. Chloral

may be used as a rectal injection in cases where the stomach is non-retentive. In some cases the warm bath is desirable and helps to calm the muscular system.

The diet should be carefully regulated and stimulants should not be given unless demanded by the condition of the pulse. In the later stages signs of collapse should be watched for, and that condition anticipated, when possible, by the prompt administration of a rapidly-acting stimulant, such as ammonia. Should the patient recover from the acute stage of the disease, diuretics, including the acetate and iodide of potassium, should be employed, with tonics, massage, and electricity, in order to increase the nourishment and activity of the muscles. Although the percentage of recoveries is exceedingly small, it is large enough to warrant the utmost zeal in the treatment of these distressing cases.

II. Chronic Hydrocephalus.

Definition.—Chronic hydrocephalus means a progressive accumulation of serum within the ventricles of the brain, or in rare cases external to the brain and between its membranes, or between them and the skull itself; or in all of these situations. It is characterized by enlargement of the head, an almost pathognomonic facies, and by a progressive tendency toward death; often from gradual failure of the vital powers, or from intercurrent disease, or more rarely from rupture of the head.

Varieties.—The term *internal* hydrocephalus is used to denote the cases in which the effusion is ventricular, while *external* hydrocephalus is used to denote the cases in which the effusion is external to the brain. The former class of cases is by far the most numerous, and is meant when the word hydrocephalus is used alone. The disease may also be

primary or secondary. Many of the cases are congenital, but in the majority of instances it is first noticed some weeks after birth.

Symptoms.—The symptoms of chronic internal hydrocephalus and the external variety of the same disease are similar and differ only in degree. External hydrocephalus is extremely rare, and is secondary, in the vast majority of the cases reported, to meningeal hæmorrhage and to pachymeningitis. It is also found in cerebral atrophy, probably as a compensating lesion, and also has been found in cases of congenital cerebral malformations. The amount of fluid found is very small in comparison with that found in internal hydrocephalus, but some cases have been reported in which the head was decidedly enlarged and the sutures separated.

Internal hydrocephalus, which is the ordinary variety met with in practice, presents as its chief symptom an enlargement of the head. In some cases this enlargement is very great, as in a case reported by Steiner, which exhibited a cranium $32\frac{3}{4}$ inches in circumference at the eighth month. The normal circumference of the head at one year is given by Holt as from 18 to 19 inches. The increase in size of the head is usually in all directions, and the sutures in marked cases are widely separated, while the cranial bones are expanded and thinned out until sometimes they have a parchment-like sensation to the touch. The fontanelles are very large and bulging; the veins of the scalp are engorged; fluctuation of the head is quite common, and it may also be translucent to light. The scalp is stretched and thin and exhibits very little hair.

On the other hand, internal hydrocephalus may exist with no perceptible enlargement of the head and with per-

fect, and even premature, ossification of the cranial bones. Primary cases of internal hydrocephalus are most often congenital, but in most cases the condition is only recognized after some weeks subsequent to birth; but in other cases the condition develops rapidly *in utero*, and puncture of the head may be necessary to effect delivery. In the largest class of cases nothing is noticed until several weeks have elapsed after birth, when the abnormal size of the cranium attracts attention. The child is also noticed to have difficulty to support or move the head, or is incapable of supporting it at all. Soon drowsiness and apathy are apparent in the infant, and it sinks into a condition of hebetude with all the senses less acute than normal. There is apt, at this time, to be either undue flaccidity or stiffness of the extremities. The latter condition is more common and the thumbs are adducted with the fingers tightly closed. The pupils are usually contracted, but at times irregular or dilated. There is marked general emaciation. Convulsions may occur and be repeated, and slow rolling of the eyeballs laterally or more or less strabismus may be features of the case.

Literature of '96-'97-'98.

Case of a male aged 22 years at time of death. Had "water in the head" when a year old, but was supposed to have recovered from this, though the head remained large. He grew up a bright, intelligent child till his seventh year, when the head-symptoms recurred and rapidly developed. Very soon he became blind, and a few years afterward his speech also was lost, though hearing remained unaffected till death. During the course of the disease he was subject to infrequent and very slight convulsions.

At death the skull was completely ossified, the face infantile in size and appearance, and the teeth decayed.

The body and the limbs were shrunk

to the skeleton, and of board-like rigidity. Only the shoulder and fingers of the right side were movable, voluntary movement being accompanied with tremors. For fifteen years he had been nursed in the arms like an infant, constantly whining and crying out. Death was preceded by coma of about four hours' duration. John Lindsay (*Brit. Med. Jour.*, May 9, '96).

Idiopathic internal hydrocephalus in the adult consists in an ependymitis giving rise to a serous effusion into the ventricles of the brain. The causes, so far as known, are injury to the head, mental overstrain, alcoholism, disease of the middle ear, and acute infectious diseases. The affection may be either acute or chronic. The chronic cases present symptoms so closely resembling tumor that they are usually diagnosed as such. The general symptoms are headache, vomiting, fever, stupor, delirium, optic neuritis, and convulsions. The local symptoms are usually paralysis of the cranial nerves, especially exophthalmos, pain and rigidity in the neck and extremities, and hyperæsthesia. The acute form may, after a course of some weeks, end in either complete recovery or death, or become chronic. The chronic form may pursue a varied course, with remissions and acute exacerbations, continuing for years, and ending finally in recovery or in death. Martin Prince (*Jour. Nerv. and Mental Dis.*, Aug., '97).

The rapidity of the enlargement differs very much in different cases, and the clinical history depends largely upon this fact. In cases in which the increase of fluid is very slow the brain seems to accommodate itself to the pressure, and the symptoms of intracerebral pressure may be very few or almost entirely lacking until the case is far advanced. When chronic hydrocephalus is secondary, and arises after ossification of the cranial bones is firmly established, the symptoms of increased cerebral tension are earlier and more markedly seen, although the amount of fluid in the ventricles is relatively very small in comparison to the

primary cases. A well-developed case of internal hydrocephalus presents quite a striking and characteristic appearance. The face is small and overshadowed by the enlarged cranium, the forehead is prominent and bulging, the eyes are directed down and formed so that the white of the eye is always more or less uncovered by the upper lids, the child is often restless, and there is frequently twitching of the extremities; a short, sharp cry is often given, and, taken in connection with the emaciated body, the picture presented is almost pathognomonic of the disease. The head is often rather flat behind, with bulging sides and greatly-rounded frontal regions.

Etiology.—Chronic hydrocephalus arises often, especially the congenital cases, without any demonstrable lesion of the brain. In many cases it is due to meningitis, or to other organic disease of the brain, such as tumor. Some authorities attribute a large proportion of the cases to syphilis, which certainly does appear often in the family histories.

Observations made upon 18 cases of hydrocephalus. Of these, 3 had well-marked symptoms or signs of congenital syphilis. Among the remaining 15, 13½ per cent. presented signs of enlarged liver and spleen, and which the writer believes were cases of hereditary syphilis, the result of an attenuated virus. It was noted that the apparently-healthy mothers of hydrocephalic children aborted more frequently than mothers who had borne healthy children. H. Elsner (*Jahrbuch. f. Kinderheilk.*, B. 43, H. 4).

Distinction must be drawn between congenital and post-partum hydrocephalus. In the former only two spaces are found filled with fluid. Hydrocephalus attributed to an obstruction to the flow of the cerebro-spinal fluid. The post-partum form generally arises in the first half-year of life, following various infectious diseases, such as syphilis, tuberculosis, and also rickets. Treatment

is useless; puncture brings about a temporary improvement and sometimes causes improvement in symptoms due to brain-pressure; but the fluid collects again and the children die from marasmus due to great loss of albumin. Pott (Med. Press and Circular, Nov. 13, '95).

Other authors ascribe the congenital defect to rickets, but this connection is not by any means clearly proved, for much confusion has arisen from the fact that, clinically, rickets and hydrocephalus have frequently been confounded, but they are sometimes associated. Primary hydrocephalus has also been causatively referred to tuberculosis, but there is lack of positive evidence. The influence of heredity is probably an important factor; often two or more children in the same family have been affected.

Extreme overwork and worry in the mother is, I believe, an important factor in determining the occurrence of primary hydrocephalus. It must be admitted, however, that we are still in the dark regarding the essential causative factor of primary hydrocephalus. In some cases of secondary hydrocephalus the cause can be clearly traced to an antecedent mild attack of basilar meningitis, or to a basal tumor, or to some mechanical cause producing venous stasis in the vessels supplying the ventricles.

Two cases of hydrocephalus, associated with complete absence of communication between the fourth ventricle and the sub-arachnoid space. The ventricle in the first case was closed behind by a dense fibroid membrane between three and four millimetres thick; in the second by a close adhesion. O'Carroll (Dublin Jour. Med. Sci., Oct. 1, '94).

Literature of '96-'97-'98.

The most frequent causes of obstruction in cases of chronic hydrocephalus are simple fibrous closure of the foramen of Magendie, adhesion of the surfaces of the tonsils of the cerebellum to each

other and to the margin of the fourth ventricle, and the presence of cysts between the arachnoid and pia, at the posterior inferior aspect of the cerebellum. A. Bruce and H. J. Stiles (Scottish Med. and Surg. Jour., Mar., '98).

Pathology.—The lesions found post-mortem are caused by the enormous dilatation of the ventricular cavities in which the effusion usually accumulates. Thus in very marked cases all the walls of the ventricles are extremely thin, the septum lucidum is obliterated, and sometimes the brain-substance forms a mere envelope for a large central cavity formed by the gradual expansion of the ventricles. In more extreme cases nearly all of the brain-substance may have disappeared through the effect of the great pressure, and the brain resembles a cystic tumor, with only the basal ganglion and cerebellum and portions of the temporo-sphenoidal remaining, as in a case of Peterson's, referred to by Holt. The fluid found in cases of chronic hydrocephalus is slightly alkaline, translucent, specific gravity about 1005, and contains a trace of albumin and sometimes sugar. It also contains traces of alkaline chlorides and phosphates. The fluid in cases arising from meningitis is usually more turbid and contains a larger percentage of albumin. The quantity of fluid varies from a few ounces, in secondary cases, to six pints or more in primary cases.

Literature of '96-'97-'98.

Hydrocephalic fluid is sterile and faintly alkaline and of a specific gravity varying from 1005 to 1010, having no toxic action upon animals. The proportion of albumin remains constant (about 0.25 per cent.), despite repeated punctures. Glucose has never been found, nor has peptone, urea, mercury, or potassium iodide. Salts are present in small quantity. It has the same chemical composition as physiological cerebro-spinal fluid, and consequently is not an exudate

or transudate, but a true secretion. Con-cetti (*Wiener klin. Woch.*, No. 42, S. 934, '97).

The brain-substance is anæmic, often there is no line of demarkation between the gray and white matter, and the effects of pressure are evident in bad cases, which show, under the microscope, marked degeneration of the nerve-elements. In lesser grades of effusion the microscopical changes may be scarcely noticeable. The ependyma may be normal in appearance, but is often found thickened, infiltrated with leucocytes, and granular to the naked eye. In some cases it has undergone degenerative changes. In most cases some changes are found in the ependyma, and it is probable that these lesions are often directly responsible for the effusion itself, and that they result from an antecedent attack of ependymitis, simple or specific in character, and often occurring in foetal life.

The bones of the cranium are more or less widely separated, sometimes to the extent of three inches. More rarely premature ossification has occurred, and in these cases the head is not enlarged. The cranial bones are remarkably thinned, and may be almost as thin as paper. Spina bifida is quite frequently associated with hydrocephalus, and, less frequently, some form of meningocele or encephalocele complicates the case.

Prognosis.—Complete recovery is practically unknown. In the most favorable cases the enlargement of the head spontaneously ceases after some years, and the patient may live for many years, but with no diminution in the size of the cranium. Mental defects are common in such cases. The majority of cases progress more or less rapidly to a fatal end. The rapid cases die within the first year, and it is very uncommon for a case of

marked infantile hydrocephalus to live over the sixth year of life. Death usually results from marasmus, intercurrent disease, or from convulsions ending in coma from which the patient cannot be roused. Very rarely rupture of the head is a cause of death.

Diagnosis.—The diagnosis is usually an easy one. Chronic hydrocephalus must be distinguished from rickets and hypertrophy of the brain. No error is liable to occur in the very marked cases, but when the effusion is of moderate amount the diagnosis may demand careful examination. From hypertrophy of the brain hydrocephalus is separated by its more rapid development, the greater enlargement of the head, the fluctuation which is often present, the universal character of the expansion of the cranium, which is more marked at the vertex in hypertrophy of the brain, and by the almost pathognomonic facies of hydrocephalus, including the oblique direction of the eyes, with failure of the upper lid to completely cover the eyeball. To the touch hydrocephalus is softer and more compressible than hypertrophy.

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Diagnosis of idiopathic internal hydrocephalus in the adult: great stress laid upon the variation in the intensity of the symptoms from day to day. These remissions and intermissions in the chronic cases must be largely relied upon to distinguish them from cases of brain-tumor. Martin Prince (*Jour. Nerv. and Mental Dis.*, Aug., '97).

From rickets chronic hydrocephalus is distinguished by the rounded head, which in rickets is square or angular and often marked by nodules; also by palpation and the other signs of the hydrocephalic head above noted. In rickets, also, there will usually be other evi-

dences of the disease in other parts of the body.

Cases of chronic external hydrocephalus may present more difficulties in diagnosis, but they are of very rare occurrence, and careful examination will usually separate them from the cases under consideration.

Treatment.—The treatment of chronic hydrocephalus by internal remedies only rarely results in any benefit. Probably the best diuretic and alterative in these cases is the iodide of potassium, which should be given a trial in cases where it is not especially contra-indicated.

In all cases, of hydrocephalus congenital syphilis should be looked for, and, if found, antisyphilitic treatment should be adopted energetically and as early as possible. Heller (*Deutsche med. Woch.*, June 30, '92).

Literature of '96-'97-'98.

Case of child, 7 months old, suffering from chronic hydrocephalus. The head was enlarged, the fontanelles were wide open and bulging, and the veins of the face and scalp were dilated. The child was treated with potassium iodide internally (2 or 3 grains daily), and in five months all signs of chronic hydrocephalus had disappeared. J. Heller (*Deut. med. Woch.*, No. 5, '98).

Surgically, compression of the skull by adhesive plaster applied in strips has been tried, and cases of marked improvement have been reported as resulting from this treatment. The treatment much in vogue is a combination of pressure with adhesive strips covering in the entire vault and sides of the cranium, combined with occasional aspiration of moderate amounts of fluid, followed by the reapplication of the adhesive plaster. The effects of the pressure must be carefully watched and the strips loosened or removed should dangerous symptoms appear. If syphilis is suspected mer-

curial inunctions to the head should be practiced.

Other modes of treatment are: incision with drainage, puncture by the trocar, blisters, and lumbar puncture. When any operative interference is considered, the preference of the writer is for repeated aspiration with strapping of the head.

Five cases of hydrocephalus treated by puncture, in one only with success. Karnitzky (*Brit. Med. Jour.*, Oct. 31, '91).

Even when the fluid is allowed to flow out slowly, in order to avoid a too-sudden evacuation, the death of the patient, often within twenty-four hours, is not prevented. Picqué (*Le Bull. Méd.*, Oct. 28, '94).

Three punctures made in a 4-month-old baby and over 2 pints of fluid removed. There was slight temporary improvement, then Cheyne-Stokes respiration and death. Rachitis considered as an important factor in the etiology of the disease, and rachitic changes in the blood-vessels, particularly the veins, may cause stasis and transudation. Withdrawal of the fluid by means of several punctures, taking away small quantities, is preferable to removal of a large amount of fluid at one puncture. Ischer-nomor-Sadernowski (*Archives of Pediatrics*, July, '94).

Ten ounces of fluid removed, with the aspirator, from the head of a child 2 years old, with satisfactory result, the fontanelles closing and the child becoming able to walk. Tordoff (*Brit. Med. Jour.*, Apr. 18, '91).

The point at which it is best to trephine for the purpose of reaching the lateral ventricles is *two and a half* centimetres above and three centimetres behind the external auditory meatus. Moussous (*Jour. de Méd. de Bordeaux*, July 26, '91).

Case of a colored child, now 6 years old, operated on successfully for hydrocephalus in infancy. Convulsions and other pressure symptoms had been present; aspiration was repeatedly done, with only temporary benefit, and an in-

cision was made through the fontanelle, with result stated. Vinke (*Weekly Med. Rev.*, Feb. 28, '91).

Case of a boy, aged 3 years, hydrocephalic from the age of 9 months; his intellect was unaffected, but he suffered from sleeplessness and pain. During anæsthesia a trocar was thrust through "the anterior and outer corner" of the anterior fontanelle. downward and inward; on reaching the ventricle, a jet of clear, serous fluid spouted out. Drainage was made by means of a collared cannula, which, however, was pushed out in about a week's time by the healing process. Recovery took place without a bad symptom. Illingworth (*Brit. Med. Jour.*, Apr. 4, '91).

Case of a child, 25 months of age, blind, deaf, and idiotic. Five centimetres above the external auditory meatus a large opening, four centimetres in diameter, was made. A small opening was accidentally made in the dura mater by the perforator, from which a large quantity of cerebro-spinal fluid escaped. The skin was then sutured, a drain being employed to favor the exit of the fluid. The pulsations of the brain increased as the fluid drained away. Four months after the operation the child began to walk, but is still blind. Phocas (*Revue Men. des Ural. de l'Enfance*, Feb., '92).

Of six cases, all tapped more than once, four improved and two almost recovered. The operation, if performed aseptically and the fluid drawn off slowly with the head well depressed, is not attended with the danger usually ascribed to it; improvement usually follows the operation; and if done sufficiently early there is some prospect of the child's becoming a useful member of society. Hern (*Brit. Med. Jour.*, Nov. 11, '93).

Puncture of the skull favored in the treatment of hydrocephalus. The advantages are: 1. Cessation of convulsions. 2. Quieting of the restless, screaming patient. 3. Good influence on bodily development. 4. Improvement or saving of the physical functions. 5. Restoration of sight when lost. The disadvantages are: 1. Formation of an hæmatoma; very rare, and usually avoidable. 2. Infectious meningitis; avoidable by aseptic.

sis. 3. Meningitis through pressure; gangrene; occurs also without puncture, and is avoidable by drawing off small quantities at a time. 4. Collapse; never occurs in dangerous degree under favorable conditions. Wyss (*Corres. f. Schweizer Aerzte*, Apr. 15, '93).

Trephining and tapping the lateral ventricles are indicated for distension due to chronic hydrocephalus, with moderate distension of the ventricles, without enlargement of the head; but if there is great distension of the ventricles with enlargement of the head, the operation would lead to fatal result. Frank (*Annals of Surg.*, Apr., '94).

Puncture regarded as not a dangerous procedure if carried out under antiseptic precautions, and if the fluid be evacuated in small quantities at intervals of several weeks. The employment of permanent drainage is more dangerous than evacuation of the fluid by puncture or even aspiration.

Puncture is indicated in those cases in which, in a previously healthy child, symptoms of hydrocephalus rapidly develop; if a progressive enlargement of the head be distinctly noticeable; if marked bodily or mental impairment be threatened. Raczyński (*Oesterr-ungar. Centralb. f. d. Med. Wissen.*, No. 20, '95).

Paracentesis of the spinal canal substituted for trephining of the skull in 3 cases of hydrocephalus. The needle of a Pravaz syringe being introduced between the third and fourth lumbar vertebrae; in all, the pressure symptoms were relieved as the fluid escaped, and in one, a child of 2 years with acute hydrocephalus, the benefit seemed to be permanent. Quincke (*Inter. klin. Rundschau*, May 3, '91).

Quincke's statements in regard to the comparative ease and safety of puncture and drainage of the spinal canal in hydrocephalus confirmed. In cases of high pressure a small fountain of cerebro-spinal fluid flows from the cannula. The quantities of fluid drawn off vary between 1 and 3 ounces. The pulse is at first arrhythmic, but soon becomes steady again. It should be performed only under chloroform narcosis. Operated in twenty-two cases forty-one times without

harm. Von Ziemssen (Centralb. f. d. Gesamnte Therap., July, '93).

Every effort should be used to increase the nutrition of the patient by codliver-oil, tonics, massage, and careful feeding, in the hope that the effusion may become self-limited and permit of life's being continued with more or less impairment of the mental and physical health.

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HYDROCHLORIC ACID.—Hydrochloric acid is a clear, colorless, pungent, fuming liquid having a strong acid odor and taste. It is miscible in all proportions with alcohol and water. It is incompatible with the alkalis and their carbonates, and with the salts of lime, lead, and silver.

Preparations and Doses.—Hydrochloric acid, 5 to 10 minims (diluted).

Hydrochloric acid, dilute (10 per cent. acid), 10 to 30 minims.

Physiological Action.—In common with other mineral acids, hydrochloric acid in its pure form is a decided caustic and escharotic. Its great affinity for water and its combination with the alkaline bases cause it to attack the living tissues energetically and induce destructive changes. Its caustic action is not as powerful or far-reaching as that of sulphuric or phosphoric acid. When ingested in a diluted form and in medicinal doses, its first action is to augment the salivary secretion. It is a general law that acids applied topically check the production of acid secretions from glands, while they increase the flow of alkaline secretions. Besides acting in this manner, the acid also acts through the cerebro-spinal nerves supplying the gland (Ringer). On reaching the stomach the acid combines with the alkaline bases present there and forms salts (hy-

drochlorates), which are usually soluble and somewhat irritating. Hydrochloric acid is normally present (0.2 per cent.) as an ingredient of the gastric juice; it aids the pepsin to digest and render soluble the albuminous and albuminoid food-principles, converting them into peptones. It also aids in the transformation of pepsinogen into pepsin.

Hydrochloric acid has a very high diffusive power and passes readily through animal membranes. Any portion of ingested acid which escapes union with the alkaline bases in the stomach diffuses rapidly into the blood and there forms salts with the bases of that fluid, setting free the weaker acids; this decreases the alkalinity of the blood and increases the acidity of the urine.

Poisoning by Hydrochloric Acid.—Hydrochloric acid is an irritant and corrosive poison. When taken in a concentrated form it destroys the mucous membrane of the mouth, epiglottis, œsophagus, and stomach, and violent gastro-enteritis attended with very alarming symptoms ensues. Pain is present throughout the digestive tract; vomiting of coffee-ground matter, blood, or even portions of the mucous membrane is associated with feeble pulse and clammy skin. Death occurs from collapse. Eschars are formed externally, and, although the acid leaves a yellow stain on clothing, it does not stain the skin. If the case is seen very early, the characteristic odor of the acid may be detected in the breath, and whitish pungent vapor may be seen issuing from the mouth.

In acute poisoning with the mineral acids renal changes are constant. K. N. Vinogradoff (Trans. Third Gen. Meeting Russian Med. Men at St. Petersburg, No. 2, p. 38, '89).

Conclusions based on observations on cases of poisoning with hydrochloric acid: (1) it produces severe gastritis,

with embryonic proliferation and extensive cellular necrobiosis; (2) there is great danger of penetration of the caustic liquid into the respiratory passages during efforts at vomiting; and (3) such efforts, therefore, should be prevented, if possible, by washing out the stomach. Letulle and Vaquez (*Archives de Phys.*, Nos. 1, 2, '89).

Fatal case of poisoning by hydrochloric acid observed. Patient took about an ounce of the drug by mistake, and the usual corrosive symptoms followed. Death ensued on the ninety-fourth day. P. J. Duncan (*Lancet*, Apr. 12, '90).

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Case of poisoning by hydrochloric acid in a woman, who drank 1 tablespoonful of pure muriatic acid. Besides burning and pain in the stomach, vomiting, diarrhœa, and cramps in the lower extremities, there were observed: (a) Absolute loss of tendinous reflexes on the first day of poisoning; this symptom disappeared on the second day; consciousness was complete. (b) Entire absence of injury of mucous membrane of the mouth. (c) Albuminuria, the sediments of the urine containing numerous hyaline and granular casts and purulent corpuscles. (d) One day's fever 102° F. on the sixth day of the disease, without any apparent cause. Lande (*N. Y. Med. Jour.*, June, '97).

Treatment of Poisoning by Hydrochloric Acid.—In these cases the use of the stomach-pump or stomach-tube is contra-indicated. The chemical antidotes are the alkalies and their carbonates, magnesia, lime (wall-scrapings, if nothing better), and soap-suds. The administration of albumin, eggs, milk, oils, etc., will act mechanically to protect and soothe the corroded tissues. Opium by mouth or by hypodermic injection is useful to relieve the pain and irritation. To counteract the great depression which these cases present, intravenous injections of ammonia may be made and nutrient and stimulant enemata given. If

undiluted acid has been swallowed there is but little hope that the above remedies, or any other, will save the patient.

Therapeutics.—Hydrochloric acid is seldom used as a caustic, though its services may be marked for that purpose in sloughing gums of mercurial stomatitis, mucous patches, etc., if nothing better is at hand.

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For cauterizing enlarged tonsils hydrochloric acid applied by a long capillary tube to the excretory ducts of the tonsils, three in each gland, at a sitting twice a week recommended. This is painless and produces no inflammation or swelling. Five or six applications are sufficient for moderately-enlarged tonsils. Kendal (*Ann. of Ophthal. and Otol.*, '96).

Eight cases of sinuses leading to necrosed bone treated by the local use of hydrochloric acid. The acid employed was in the concentrated form, employed twice a week, the number of minims depending upon the individual case and the amount of bone exposed. The conclusions were as follow: 1. No evil effects have resulted from its use. 2. The use of the acid in its concentrated form is preferable. 3. When the area of necrosis is extensive operative methods are advised. 4. Its action is limited to the necrosed area, whereas curetting may remove both diseased and healthy bone. 5. By the disintegration of the dead bone the newly-formed tissue has a better opportunity for its more rapid development. Waterman (*N. Y. Med. Jour.*, Aug. 8, '96).

INTERNAL ADMINISTRATION.—The pure acid is never used internally, except when largely diluted. It is not stable, but must be kept in dark bottles, well stopped and in a cool place. The dilute acid may be given in beef-juice, in lemonade, or in syrup of lemon. When combined with the bitters, its efficiency is increased as a stomachic. In appropriate cases it may be combined with

pepsin to increase the efficiency of the latter. It is most useful in gastric disorders and diseases consequent upon impaired digestion and assimilation.

GASTRIC DISORDERS.—In atonic dyspepsia, dilute hydrochloric acid may be given alone or combined with some preparation of pepsin, immediately *after* meals. Thus given, it is also useful when there is a deficiency of acid in the gastric juice, as in gastric cancer, a condition often made manifest by alkaline eructations.

In excessive acid formation, acid eructations, pyrosis, heart-burn, and ulcerative stomatitis it should be administered *before* meals. If the use of this remedy be too long continued the improvement which at first follows its use lessens and then ceases, and a train of symptoms arises which require an opposite plan of treatment: a catarrhal inflammation of the gastro-intestinal tract is induced, which is accompanied with diarrhœa, and perhaps wasting.

Weak solution of hydrochloric acid by internal administration recommended as remedy for nausea and vomiting. S. Alkiewicz (Nowiny Lakarske, Feb., '92).

Hydrochloric acid is capable of exercising a double action upon the digestion: an enpeptic action and an antiseptic action. As an enpeptic, it should be employed in all cases in which the digestive power is diminished and the amount of gastric juice is lessened. The following is the method of administration:—

R Hydrochloric acid, 15 minims.
Distilled water, 8 fluidounces.

M. Sig.: A wineglassful toward the end of each meal and one-half hour after.
Or

R Hydrochloric acid, 45 minims.
Distilled water, 9½ fluidounces.

M. Sig.: A tablespoonful in half a glass of warm or cold water at the end of each meal.

The contra-indications to the employ-

ment of this drug are: all forms of hyperacidity and dyspepsias accompanied by hyperæsthesia. The treatment should not be continued for more than three weeks or a month, to be resumed, if necessary, after a remission of fifteen days. As an antiseptic it has produced good results in cases of fermentation with pyrosis due to the formation of organic acids, in dilatation of the stomach, etc. It should be given in these cases two or three hours after the meal. Huchard (Jour. des Praticiens; Ther. Gaz., Aug., '95).

FEVERS.—The treatment of fevers by hydrochloric acid is an old and favorite one. The use of the acid increases the secretion of the salivary glands and of the mucous membranes of the mouth, relieving the dryness of the tongue and fauces; it makes good the deficiency of acid in the gastric juice, which deficiency is a characteristic of most febrile affections. In typhoid fever, alone, or, better, combined with pepsin, it restrains the diarrhœa, increases the digestive powers, relieves the dryness of the mouth and tongue and aids in preventing the accumulation and production of sordes. In scarlet fever and other eruptive fevers it relieves adynamia by improving digestion and assimilation.

PHTHISIS.—Associated with this disease there is usually a deficiency of the normal acid of the stomach and of the pepsin. Hydrochloric acid is useful in these cases, especially when the administration is stayed occasionally for a short time and then resumed.

URINARY DISORDERS.—When uric acid is present in the urine in excessive amounts as a result of faulty digestion and assimilation, the use of hydrochloric acid will cause a disappearance of the uric acid by improving the digestion.

CUTANEOUS DISORDERS.—In all skin affections which are symptomatic of impaired digestion and assimilation, the

internal use of this acid is followed by good results. This explains the value of the remedy in certain cases of lepra, impetigo, acne, erythema nodosum, urticaria, etc. In very weak solutions it is a useful topical remedy against urticaria, profuse sweating, and torpid skin; for this purpose a general bath may be prepared ($\frac{1}{2}$ to 1 ounce to the gallon of water).

POISONING BY ALKALIES.—Hydrochloric acid diluted may be used as an antidote in cases of poisoning by the alkalies, but sulphuric acid, properly diluted, is preferable, as the salts formed by the former are usually soluble and somewhat irritating.

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HYDROCYANIC ACID.—Hydrocyanic acid, also known as cyanhydric or prussic acid, hydrogen cyanide, and formonitrile, is official in a 2-per-cent. solution (*acidum hydrocyanicum dilutum*, U. S. P.), which is a colorless liquid, having the odor and taste of bitter almonds. Dilute hydrocyanic acid is prone to decompose, becoming more or less brown in color, rendering it unfit for medicinal use; it should therefore be kept in a dark, cork-stopped bottle, and dispensed with a pipette, rather than by pouring it. The metallic salts are generally incompatible; also the red acid of mercury and the sulphides; chlorine-water and all oxidizing agents change this acid into formic acid.

Dose.—*Acidum hydrocyanicum dilutum* (2 per cent.). 1 to 15 minims.

Physiological Action.—Applied to the mucous membrane or the abraded skin, hydrocyanic acid rapidly diffuses into the blood. In medicinal doses it has a calmative effect. In larger doses it may cause nausea, faintness, giddiness, a

feeble pulse, and great muscular weakness. Owing to its great diffusibility, its absorption is very rapid. It acts principally on the respiratory centre and the heart, and is eliminated very rapidly (one-half to one hour). If a larger quantity is taken it exercises a paralyzing effect upon every part of the body; the respiration, heart, brain, nervous system, and all the vital parts are paralyzed at once.

Poisoning by Hydrocyanic Acid.—Prussic, or hydrocyanic, acid is one of the most rapid and violent poisons known. A single whiff of the pure acid will kill; it is therefore very unsafe to handle. When a large toxic dose is taken, death may occur in from two to five minutes. The usual symptoms are as follow: Sudden and complete insensibility, the eyes protrude with a glistening stare, the pupils are dilated and unaffected by light, the skin is cold and clammy, the extremities are relaxed and cold, the respiration is slow and convulsive, pulse feeble or imperceptible, and involuntary evacuations of urine, fæces, and semen. The odor on the body, the wide-staring eye, the clenched teeth covered with froth, and the livid cyanosed face are the diagnostic signs (Hare).

Series of experiments performed consisting in injecting amygdalin and emulsion into the veins, so that on coming together they would form hydrocyanic acid. The changes which took place consisted in a slowing and final arrest of the respiratory movements, followed several minutes afterward by stoppage of the heart. These same results are reached even when artificial respiration is kept up from the first. Thirty minims of a 1 to 400 solution of hydrocyanic acid injected into the jugular vein of a dog weighing 38 pounds is sufficient to produce death by the methods named above. When the drug is given hypodermically to the frog the same phenomena occur, preceded by a complete loss of reflex ac-

tivity. Gréhan (La Semaine Méd., Sept. 25, '89).

Absorption of hydrocyanic acid in the eye produces death from respiratory failure in from two to three minutes, by the passage of the poison into the blood. Gréhan (Brit. Med. Jour., Mar. 2, '91).

Literature of '96-'97-'98.

Results of forty-three observations upon various animals: Hydrocyanic acid stands foremost among agents likely to prove of antidotal value in chloroform poisoning. The best way to apply it is undoubtedly by means of a graduated drop-tube on the back of the tongue. The exact dose in the dog and cat averages about one minim of Scheele's acid for every seven or eight pounds of live body-weight. The object must be to give just enough acid to produce the preliminary excitant effect upon the respiratory centre. Frederick Hobday (Lancet, Jan. 1, '98).

Treatment of Poisoning by Hydrocyanic Acid.—In poisoning by hydrocyanic acid the most useful remedies are cold affusion to the head and spine; ammonia by inhalation, by mouth, and by intravenous injection; artificial respiration, atropine, and heart-stimulants. If seen early, evacuation of the stomach by emetics or irrigation may be useful, the addition of peroxide of hydrogen to the irrigating fluid being capable of transforming any prussic acid present into oxamide, which is relatively harmless.

Therapeutics.—Hydrocyanic acid is used principally to allay pain and spasms when taken internally. When applied externally it allays itching.

SPASMODIC DISORDERS.—Hydrocyanic acid is useful in functional disorders of the pneumogastric nerve. In various forms of nervous vomiting, the vomiting of pregnancy, the reflex vomiting of phthisis, and that which accompanies some cerebral diseases, Bartholow suggests the following mixture:—

℞ Acidi hydrocyan. dil., 1 drachm.
Aquæ laurocerasi, 2 ounces.

M. Sig.: A teaspoonful every two to four hours.

Nervous cough is often promptly relieved by 2 or 3 drops of dilute hydrocyanic acid in a teaspoonful of wild-cherry syrup.

GASTRIC DISORDERS.—Nervous gastralgia is quickly cured by this remedy. Nervous and irritative dyspepsia and enteralgia are promptly relieved.

CUTANEOUS DISORDERS.—Prussic acid affords relief in many skin affections in which itching is a characteristic symptom. Fox suggests the following formula in pruritus, lichen, and in the syphilodermata:—

℞ Hydrargyri bichloridi, 1 grain.
Acidi hydrocyanici dil., 1 drachm.
Emulsi amygdalæ, 6 ounces.

M. Sig.: Apply externally.

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HYDROGEN DIOXIDE.—Hydrogen dioxide, peroxide; peroxide of hydrogen; or oxygenated water in a pure, undiluted state, is a syrupy liquid of unstable composition. It readily decomposes into oxygen and water. It is rarely met with in its pure state.

For medicinal and surgical uses a diluted solution is official; it deteriorates by exposure to heat, sunlight, or prolonged shaking. It is, however, the most stable solution that has been prepared.

Preparation and Dose.—Aqua hydrogēni dioxidi (3 per cent. or 10 vol., U. S. P.), 30 to 120 minims.

Physiological Action.—The official solution has a slightly acid taste, owing to the presence of a small amount of acid added as a preservative. Taken into the

mouth it foams and produces a slight pungent, stinging sensation. Its properties are those of an antiseptic, deodorant, and styptic. Its effects are produced by the liberation of oxygen and by consequent oxidation. Taken internally, hydrogen dioxide is not poisonous.

The possibility suggested that the peroxide contains impurities of an irritating nature, these impurities being the salts and acids used in the production of the remedy in question, and which in themselves must be poisonous. Blackader (Boston Med. and Surg. Jour., May 19, '92).

At ordinary temperatures and with ordinary agitation hydrogen dioxide is practically decomposed in eight weeks. Pressure exerts no restraining influence in this change. Boroglycerin, added in proportion of 1 per cent., retards decomposition, but does not prevent it. Extemporaneous preparation of hydrogen dioxide as required is recommended. Squibb (Ephemeris, Jan., '94).

While taking hydrogen peroxide 10 out of 18 patients noticed that their urine was increased in quantity. D. M. Cammann (Med. Record, Nov. 2, '89).

Therapeutics.—Hydrogen is an active destroyer of false membranes, pus, and pathogenic germs. It is sometimes used as a diagnostic means for the detection of pus, since contact with pus causes a foaming and frothing until all traces of pus have disappeared. It is also used in dressing wounds, etc.

Hydrogen peroxide especially recommended internally in diabetes, phthisis, pertussis, syphilis, and angina pectoris. In diabetes it may be combined with codeine in the following prescription:—

R Codeine, 3 grains.

Alcohol (sp. gr., 830). 2 ounces.

Solution of hydrogen peroxide (10-volume strength), 2 ounces.

Aq. destil., 12 ounces.

M. Sig.: One-half fluidounce twice daily, in a wineglass of water.

In pertussis 10 to 60 minims of ozonic ether in dilute alcohol is given in water,

four times a day. The ozonic ether is prepared by agitating a 30-volume solution of the peroxide with anhydrous ether (equal volumes). B. W. Richardson (Lancet, Mar. 28, Apr. 4, '91).

DIPHTHERIA.—Hydrogen dioxide is one of the most valuable applications for the destruction and removal of false membrane, and this without danger of poison or of irritation. On contact with the false membrane an active effervescence ensues, and the membrane comes away in pieces or shreds. It is best applied in spray form, using a rubber or glass-tipped atomizer on account of the oxidizing influence upon metal spray-tubes. It may also be applied by means of a swab or a glass syringe.

Hydrogen peroxide in a number of cases of diphtheria produced appearances which might have been mistaken for the original disease, but which readily disappeared on withdrawing the peroxide. The disease had not only not been benefited, but had been prolonged by the use of the drug. Jacobi (Boston Med. and Surg. Jour., May 19, '92).

Fifteen-volume solution of peroxide of hydrogen used in the form of a spray in the mouth and nose in diphtheria without any bad results. It seemed for a time to lessen the membrane, but the latter quickly returned. Buckingham (Boston Med. and Surg. Jour., May 19, '92).

Case in which, thirty-six hours after using the peroxide of hydrogen in weak solution as a spray and gargle, a whitish veil appeared in the mouth, and then beginning ulceration and a pseudomembrane over these ulcerated spots. The peroxide was stopped and the patient recovered. Caillé (Boston Med. and Surg. Jour., May 19, '92).

A reliable solution of peroxide of hydrogen is an efficient and safe germicide. By its oxidizing power it rapidly decomposes pus, diphtheritic membranes, and other pathological decayed products. It is an excellent deodorizer and a non-irritating, cleansing agent for foul wounds, abscesses, etc. It is a valuable

diagnostic agent in determining the presence of pus, and by its use in operations the danger of wounding important structures can be lessened. E. Stuver (*Ther. Gaz.*, Mar., '92).

PURULENT AFFECTIONS.—The application of hydrogen dioxide to pus-secreting surfaces and cavities is followed by the most satisfactory effects. Whenever this agent meets pus, active effervescence ensues, germs and pus are disintegrated, and the part is rendered aseptic without any fear of poison. For this purpose its use is quite extensive. Abscess-cavities, unhealthy suppurating surfaces, chancre, chancres, bed-sores, gangrenous wounds, ulcers, necrosis, cancerous wounds, etc., are all amenable to the beneficial action of this agent. Diluted with 4 to 8 parts of water it may be used with good results as an injection for gonorrhœa and leucorrhœa. Suppuration in post-operative wounds is checked and healing promoted by spraying the parts with hydrogen dioxide before applying the dressings.

Hydrogen peroxide has proved most successful in the treatment of tubercular abscesses and sores of all kinds. It is superior to anything employed in keeping drainage-tubes and deep cavities clean and sweet. T. S. K. Morton (*Med. News*, Dec. 28, '89).

Peroxide of hydrogen is successfully used in abscess of the brain, and in many other cases where suppuration is the chief feature. In affections of the eye, nose, and urethra its use may be preceded by cocaine or ether to prevent smarting. In old sinuses its employment to be followed with balsam of Peru, which encourages granulation. Diphtheritic membranes are easily removed by it. Wherever there is pus peroxide of hydrogen should be used. The substance should not come in contact with metals, nor with the hair, as it bleaches the latter. A solution kept tightly corked in a cool place remains active for many months. R. T. Morris (*Med. News*, Dec. 28, '89).

Hydrogen peroxide is not an unstable preparation if kept in a dark and cool place. It is an excellent antiseptic and disinfectant, and especially valuable in herpes progenitalis, soft chancres, and gonorrhœa. This latter disease is cured by the remedy, in injections, in from eight to twenty-four hours. Manassein (*St. Louis Med. and Surg. Jour.*, Jan., '90).

Hydrogen peroxide found of great use in fungous ulcers and cold abscesses, possessing, in the proportion of 1 to 100, an energetic disinfecting power. A solution in nutritive substance of 1 to 352 not only impedes the development, but after some days kills the spores of the bacillus of Charbon. Its action is stronger against the Charbon bacilli than is the bichloride of mercury. N. Pane (*Annali dell' Istituto d'Igiene Sperimentale dell' Università di Roma*, '90).

In 40 cases in which hydrogen peroxide was used as good results were produced as by the bichloride of mercury, and in some cases better. Buck (*Times and Register*, Jan. 3, '91).

It may be used in cases where a complete opening of a fistula or abscess is impossible. Here irrigation with the peroxide has an excellent action. If, then, an antiseptic bandage be applied, healing takes place very rapidly. If, in cachectic patients, the granulations are weak and slow in growth, one may alternate with injections of equal parts of ether and balsam of Peru. This procedure is of great value in suppurating cavities with indurated edges. Where the drug is injected into cavities, one must see that there is free exit for the gas which quickly forms. Graff (*Med. Neuigkeiten für prak. Aerzte*, No. 2, '92).

Peroxide of hydrogen valued in the treatment of exposed wounds, on the ground that it forestalls suppuration and promotes cicatrization. Application of a 15-volume solution to the nasal membrane and the mucous membrane of the cervix uteri recommended to remove adherent mucous for the purpose of medication. C. M. Fenn (*Ther. Gaz.*, Mar., '92).

Literature of '96-'97-'98.

Menthoxol, camphoroxol, and naphthoxol consist of a 3-per-cent. solution of peroxide of hydrogen, to which a quantity of alcohol and 1 per cent. of menthol, or 1 per cent. of camphor, or 2 per cent. of naphthol, respectively, have been added. They destroy the spores of anthrax within three hours and in a 10-per-cent. solution within six hours. These preparations were used in about two hundred cases of phlegmon, abscess, ulcers, and granulating wounds, sterilized gauze wetted with a 10-per-cent. solution being applied to the part with the usual cotton-wool dressing above it. The dressings were renewed, as a rule, every second day. As soon as the compound came into contact with the secretion of the wounds there was a considerable development of gas. In phlegmonous cases the necrosed tissue very soon came away, the secretion diminished, and healthy granulations appeared. Ulcers of the legs healed better under these dressings than under any other treatment. The three compounds did not show any difference in their action. They have an agreeable odor, and are therefore very useful in fetid sores or abscesses. No undesirable effect has hitherto been observed. Wagner *Deutsche med. Woch.*; *Lancet*, Jan. 1, '98).

AURAL DISORDERS.—The suppuration of middle-ear disease is lessened and the odor removed by the use of hydrogen dioxide. Impacted cerumen may be disintegrated by instilling a few drops of the solution into the ear. Violent effervescence ensues, the cerumen is disintegrated, and removal by warm water and syringe rendered easy.

Used with success in 22 cases of suppuration of the middle ear. In ozæna and rhinitis it is used in 10-per-cent. strength. F. W. Frankhauser *Times and Register*, Aug. 15, '91).

INSECT-BITES.—The application of this remedy counteracts the pain and

poison of the bites and stings of insects, bees, wasps, and hornets.

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HYDRONEPHROSIS.—Gr. *ὕδωρ*, water, and *νεφρός*, a kidney.

Definition.—A collection of urine in the pelvis and calyces of the kidney due to obstruction.

Varieties.—In addition to the usual or more or less typical form, two subvarieties are distinguishable: (a) the intermittent and (b) hydronephrosis paraplegica. In the latter type paraplegia develops as a complication, and beyond the mention of this fact it scarcely deserves a separate clinical description.

Symptoms.—The clinical symptoms are somewhat dependent upon the cause and stage of development of the hydronephrosis. When, as generally happens, the condition is unilateral, it often escapes notice, since the symptoms are slight or even wanting, until a tumor is discoverable. The ureter on the opposite side may become obstructed, followed by uræmic manifestations, the latter occurrence first inviting attention to the condition. In the bilateral form, the uræmic symptoms are apt to supervene easily. The flow of the urinary fluid may be noticeably diminished, though subject to variations. The patient may complain of frequent and acute pains that shoot about the affected loin-space and downward toward the thigh. Abnormal sensations of weight and a dragging discomfort, at times amounting to a dull, aching pain, are quite common. The latter symptom, particularly in large hydronephrotic tumors, may be continuous and distressing; less frequently the cyst is painless. The tumor may cause obstinate constipation from pressure of the colon; or it may, if moderate in size,

provoke diarrhœa, from the pressure-irritation. Resulting from the same cause are flatulency and irregular bowel-action. Among gastric symptoms, anorexia is the most common, while nausea and vomiting are sometimes associated. Hæmaturia may be present, but is rare and usually occurs with attacks of pain. Slight albuminuria may be present. The urine is of low specific gravity; the urea is diminished, and the phosphates are greatly reduced in most instances. Renal casts are absent, as a rule, unless chronic nephritis co-exists as a complication.

In all except the earliest stages there is easily detectable a swelling in the region of the affected kidney. It increases in size in a slow and gradual manner, and there is great dilatation of the pelvis of the kidney. Visible bulging usually occurs in the hypochondriac and lumbar regions.

On palpation, a rounded, firm, more or less elastic and sometimes fluctuating tumor is detected. The enlargement may be slightly tender. I would advise energetically that when the tumor is of moderate size it is most readily felt when the abdominal position is employed, examining bimanually. Percussion elicits dullness over the mass, except in cases in which the colon overlies it, when the note is tympanitic: a characteristic sign of renal tumors. Moderate enlargements generally do not descend during inspiration, though exceptions to this rule rarely occur.

INTERMITTENT FORM (LANDAU). In this variety decided variations in the size of the tumors occur: *i.e.*, coincident with a more or less sudden increase in the quantity of urine passed (polyuria) the tumor quickly diminishes. On the other hand, the enlargement gradually increases from retention as the flow of urine decreases. The principal cause of

hydronephrosis is a movable kidney, and hence the affection occurs mostly in women that have borne children. According to Albarran, the polyuria which commonly follows the attacks of pain in movable kidney is due to excessive urinary secretion, and not to a flow of urine which has previously been retained in the pelvis of the kidney. He reports a number of cases in which an operation for movable kidney, in patients suffering from intermittent hydronephrosis, was performed by himself, and total absence of dilatation of the pelvis of the kidney was noted.

Preceding and accompanying the polyuria in these cases are colicky pains, and hæmaturia is not uncommon. For obvious reasons, the tumor in intermittent hydronephrosis displays considerable mobility. The general features consist merely of a certain loss of flesh and strength incident to the associated worry and anxiety. The filling of the nephrydrotic cyst, the enlargement, and the pain of subsequent discharge, with marked diminution of the tumor, recur with variable frequency. Among the causes that are apt to produce a kinking of the ureter, and thus excite an attack, are violent physical exertion; jarring or jolting, as in riding or driving; or acute gastro-intestinal derangement, and strong mental emotions. The duration of the attacks varies from several hours to a day, though the cyst may continue to increase in size for several days after the pain has disappeared. During the intervals, and even while the greatly increased flow of urine is present, the patient feels tolerably comfortable.

The occurrence of chills, fevers and sweats, rapid pulse, nausea and vomiting, and abdominal distension is indicative of suppuration, and the appearance of the common sequel—pyonephrosis. This is

confirmed by the cloudy urine, revealing pus, following both discharge and aspiration. Chronic nephritis may supervene, as shown by the lower specific gravity and the presence of albumin and casts in the urine. The arterial tension will then

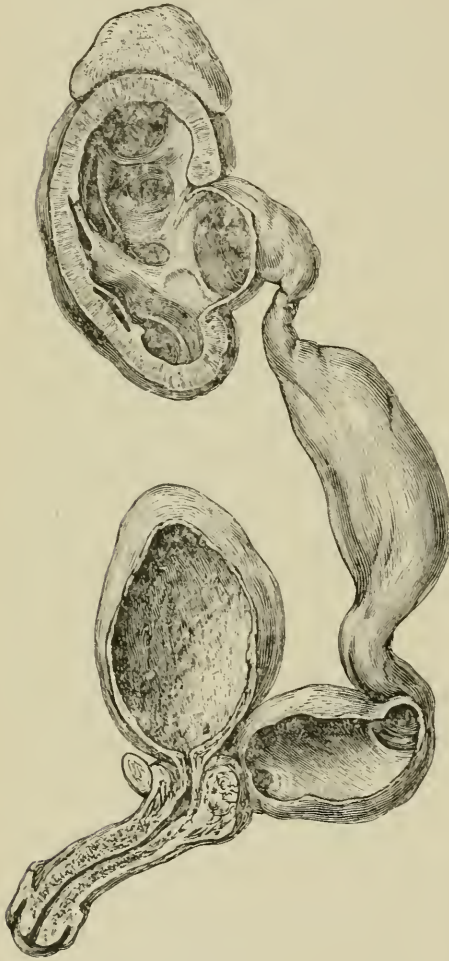


Fig. 1.—Urinary organs of a newborn child, showing mechanical obstruction. (Bland Sutton.)

be increased, as a rule. Among other sequelæ may be mentioned acute febrile or chronic afebrile uræmia, the latter having been mentioned above.

Differential Diagnosis. — (a) Pyone-

phrosis may be eliminated in the absence of an abundance of pus-cells in the aspirated fluid and of the general symptoms of suppuration.

ECHINOCOCCUS CYST.—In this disorder there is a history of close association with dogs; the size of the tumor constant and slowly increasing; urea is not demonstrable in aspirated fluid. In fluid removed by puncture the echinococcus-hooklets, shreds of membrane, and sodium chloride are found. A movable kidney is not detectable. The urine is constant in amount. Recurrences do not occur.

Additionally, hydronephrosis must be distinguished by exclusion from *ovarian cyst*, *cystic kidney*, and *tumors of the spleen, liver, and gall-bladder*. It is sometimes necessary to detect the tympanitic band, to evacuate the colon by the introduction of air, and this, coupled with a chemical examination of the fluid obtained on exploratory puncture, will suffice in most cases. With reference to ovarian cyst, it is to be recollected that a slight amount of urea is sometimes found.

Etiology.—The principal factor in the production of dilatation of the pelvis of the kidney is chronic or prolonged obstruction, caused by occlusion of the ureter, either congenital or acquired. Probably from 20 to 35 per cent. of the cases are congenital (Roberts). The former cases are due to obstruction induced by a defective development or malformation of the ureter of one or both sides, usually the latter.

An instance of hydronephrosis, occurring in a young man, in which there seems to be a congenital factor of causation. The tumor apparently followed a fall, but when the patient was but a day or two old the father had had occasion to call the attention of the physician to the enormous size of his abdomen, and

this had never entirely disappeared. The tumor at the present time was of enormous size, filling up the whole right side of the abdomen, the hypogastrium, and a part of the left iliac fossa. Lannois (Lyon Méd., Nov. 30, '90).

Literature of '96-'97-'98.

In many cases hydronephrosis develops during intra-uterine life. The specimen illustrated in Fig. 1 was obtained from an infant which survived its birth a few days. Only one kidney was present. Dissection clearly indicated that mechanical obstruction of some kind interfered with the flow of urine through the vesical orifice of the ureter. In Fig. 2 is shown an example of narrow ureter, acting as cause. Bland Sutton (Clin. Jour., July, '97).

There may be atresia, a valve-like formation, or an acute (oblique) insertion of the ureter into the kidney.

Literature of '96-'97-'98.

Apart from hydronephrosis caused by renal calculi, the most common form of obstruction capable of determining hydronephrosis is a valve-like projection which occludes the upper end of the pelvis of the kidney or one of its divisions. Fenger (Ann. of Surg., June, '96).

Excessive dilatation has occasioned more or less mechanical difficulty during labor. The causes, both predisposing and exciting, of the acquired cases are varied, and may be conveniently grouped in tabular form as follows: 1. Sex, women being more often subject to hydronephrosis than men, especially those having borne children. 2. Age; apart from the congenital cases, hydronephrosis is most common in middle and advanced life. 3. Impacted calculi in the ureter or renal pelvis. 4. Disease of the ureteral walls, as inflammatory thickening and cicatricial stenosis from ulcers. 5. Flexion and twisting of the ureter, as from movable kidney.

The usual cause for intermittent hydronephrosis is a floating kidney which, when displaced, causes a kink in the ureter, thus arresting the evacuation of urine until the organ slips back into place again. Most of these cases of intermittent hydronephrosis eventually become permanent, owing to inflammatory changes which often result in bands of adhesions, thus fastening the kidney in its displaced position. Terrier and Bau-

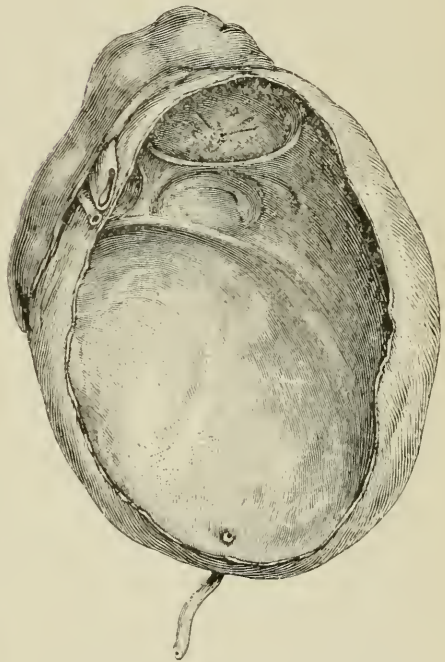


Fig. 2.—Large intermitting hydronephrosis due to an inadequate ureter. (Bland Sutton.)

douin (Revue de Chir., Sept., Oct., Dec., '91).

Simple hydronephrosis considered as due, in many instances, to an inherited tendency, often associated with more or less malposition or mobility of the kidney. Cramer (Centralb. f. Chir., Nov. 24, '94).

Hydronephrosis produced in the dog, four out of eight times, simply by separating the kidney from its attachments. Tuffier (La Semaine Méd., Dec. 1, '93).

6. Pressure upon the ureter from

without, as by tumors and constricting bands (pelvic adhesions). The gravid and retrodisplaced uterus, uterine and ovarian neoplasms, and similar conditions causing compression or traction and obliteration of the lumen of the ureter, are found in this class.

Case of cancer of the uterus which caused complete obliteration of the left ureter and almost complete obliteration of the right. The ureter was moderately and the pelvis enormously dilated, the latter forming a large pocket; the kidney itself appeared to be but slightly involved. On the left side, where there was complete obstruction of the ureter, there was almost no hydronephrosis. Frumussaine (*Bull. de la Soc. Anat.*, No. 10, '93).

Case of inguinal hernia where the hernial sac contained a knuckle of prolapsed ureter, marked hydronephrosis resulting as a consequence. P. Reichel (*Centralb. f. Chir.*, Aug. 13, '92).

Case of intermittent hydronephrosis depending upon an acute bending of the ureter in its upper portion. Braun (*Wiener med. Woch.*, July 19, '90).

Aberrant renal vessels considered as a cause of hydronephrosis, as seen in four cases. In two of these veins and in the other two arterial branches were the aberrant vessels. N. Pitt (*Brit. Med. Jour.*, Apr. 21, '94).

Hydronephrotic kidney in which the obstructive cause was a small branch of the renal artery, which crossed the ureter a short distance from the insertion of the latter into the pelvis, causing an angle in the course of the ureter and producing obstruction. Coats (*Glasgow Med. Jour.*, May, '94).

7. Diseases and tumors of the bladder that involve the ureteral orifices, particularly carcinoma, or that cause retention, as prostatic enlargement. 8. Urethral structure.

Case of double hydronephrosis due to obstruction of the ureters at point of entrance into the bladder by the thickening and infiltration of the bladder-walls from vaginal and uterine cancer. Street (*So. Med. Rec.*, Mar., '90).

Case in which the cause of hydronephrosis was a fibrous perivesical thickening at the point where the ureter enters the trigone. Martin (*Montreal Med. Jour.*, Feb., '94).

Traumatic hydronephrosis may be due (1) to serious injury, with rupture and consecutive stricture of the ureter; (2) to an extravasation of blood about the kidney and ureter; (3) to a blood-clot obstructing the ureter; (4) to displacement, by the traumatism, of a calculus, which lodges in the ureter; (5) to displacement of the kidney and closure of the ureter. P. Wagner (*Schmidt's Jahrbücher*, Apr., '94).

Pathology.—The cyst caused by a dilatation of the pelvis of the kidney, often assuming the shape of the latter, may become very large, containing as much as several gallons of fluid. The external appearance of the walls may be lobulated, particularly in medium-sized sacs; the interior, however, shows only partial septa projecting from the walls into the cavity of the sac, as a rule. According to the site of the obstruction one or both ureters may also be dilated, and if, as is usual, one kidney is involved, its fellow is often hypertrophied. Marked enlargements cause displacement of the adjacent abdominal organs.

Atrophy of the renal tissues results and is proportionate to the size of the tumor or dilatation. Accumulated liquid causes flattening and atrophy of the papillæ and gradually of the tubules and glomeruli, and in extreme cases remnants only of the renal structure remain in the walls of the hydronephrotic cyst. In the renal parenchyma (medullary and cortical) there is a growth of connective tissue, a chronic nephritis with degeneration and atrophy of the renal cells. The mucous membranes lining the pelvis and calyces first become thinned, and later thickened, by the growth of connective tissue, thus forming a dense sac-wall.

If hydronephrosis is complete,—that is, if the urethral outlet is wholly impervious,—only a moderate dilatation of the kidney occurs, since atrophy of the nephritic tissue, under such circumstances, speedily ensues, thus putting an end to the secreting process. If, however, the hydronephrosis is incomplete, great dilatation eventually takes place, since in the latter condition hypertrophy rather than atrophy of the parenchyma is the rule. Albarran and Legueu (*La Semaine Méd.*, Apr. 30, '92).

The fluid contained in the sac is usually a clear, thin, yellowish, watery urine. Its composition, however, varies. The specific gravity is low, and the reaction is often slightly alkaline. Traces of albumin, urea, and uric acid are found, although in long-standing cases the latter two ingredients may be absent. Turbidity may be observed, owed to admixture with pus, blood, or epithelium, but only in instances in which previous inflammatory conditions—as a calculous pyelitis—or local complications—as hæmorrhage, suppurative inflammation, and the like—have existed.

Prognosis.—In unilateral hydronephrosis, the more common variety, the prognosis is guardedly favorable, on account of the establishment of compensatory function on the part of the unaffected kidney, and this is particularly true if the case be one of movable kidney. The bilateral affection is always grave, having about the same outlook as chronic pyonephrosis. Among dangerous accidents and complications may be mentioned uræmia, rupture of the sac, and infection of the cyst by pus-organisms. Recovery may ensue in rare instances in which a spontaneous discharge of the fluid occurs.

Treatment.—The congenital form, when bilateral, is not amenable to treatment. It is rarely feasible to force the fluid out by manipulation of the tumor.

This method tends to remove the occlusion, when caused by a slight twist or kink in the ureter. In unilateral hydronephrosis, carefully tapping the cyst may be practiced, thus overcoming the mechanical discomfort. Operative interference, with a view to removing the special obstructive cause, is also to be encouraged and advised in suitable cases.

Double lumbar nephrotomy performed at the twenty-second hour after birth for congenital hydronephrosis. The child, several weeks after the operation, was still living and passing all his urine through the lumbar fistulæ. Henry Morris (*Lancet*, Jan. 27, '94).

In acquired hydronephrosis symptomatic treatment only is required in moderate enlargements, though sometimes gentle massage over the sac, properly directed and cautiously applied (to avoid rupture), may cause a reduction in the size of the cyst. In the majority of instances surgical measures only are of use. Repeated aspiration of the sac has in a few reported cases accomplished a cure. Surgical measures also embrace nephrotomy and drainage, nephrorrhaphy (particularly when caused by movable kidney), and nephrectomy.

Nephrectomy advocated for hydronephrosis. J. Bland Sutton (*The Clin. Jour.*, Nov. 15, '93).

In no cases in which the symptoms are mild should surgical procedures be undertaken, as in some instances of the intermittent variety.

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HYDROPERICARDIUM. See PERICARDIUM, DISEASES OF.

HYDROPHOBIA. See RABIES.

HYOSCYAMUS AND HYOSCINE.—Hyoscyamus (U. S. P.) is the leaves and flowering tops of *Hyoscyamus niger*, or

henbane, which is indigenous to the United States. The plant is an annual and belongs to the family of *Solanacæ*. The fresh herb has a rank, heavy, sickening, unpleasant odor, which disappears on drying. The plant contains hyoscyamine, an active principle (alkaloid), which occurs as white, silky crystals, and also in an amorphous form, as a brown, syrupy liquid. From the latter Ladenburg derived a new hyoscyamine. He found that hyoscine, hyoscyamine, and atropine were isomeric, having the same formula, and each being separable into tropic acid and tropine, or pseudotropine. Both hyoscyamine and hyoscine form salts with the acids.

Preparation and Doses.—Hyoscyamus, 5 to 15 grains.

Extract of hyoscyamus, 1 to 3 grains.

Extract of hyoscyamus, fluid, 3 to 10 minims.

Tincture of hyoscyamus, 10 to 60 minims.

Hydrobromate of hyoscine, $\frac{1}{200}$ to $\frac{1}{100}$ grain.

Hydrobromate of hyoscyamine, $\frac{1}{130}$ to $\frac{1}{60}$ grain.

Sulphate of hyoscyamine, $\frac{1}{64}$ to $\frac{1}{32}$ grain.

Physiological Action.—Its action on man is analogous to that of belladonna and stramonium, though milder. Children can be given a larger dose than adults. Hyoscyamine, according to Gnauck and other observers, resembles atropine in its action upon the vagus and heart-muscle, though its effects are less marked and prolonged. It seems also to exercise an inhibitory influence upon the vasomotors, especially those of the abdominal vessels. It is an active soporific.

Hyoscyamine is a serviceable hypnotic, having most of the advantages of its rivals and none of their disadvantages.

It is entirely harmless in doses which are still sufficiently strong to be effective. G. Lemoine (Gaz. Méd. de Paris, July 14, '88).

Hyoscine is eliminated as such from the system; it retards respiration, slows the pulse, dilates the pupils, diminishes salivary secretion and perspiration, but has no apparent action on the cord or motor area of the brain. Kobert and Sohrt and Konrad and Schleussner (Münch. med. Woch., p. 365, '89).

Study of the physiological action of hyoscine hydrochlorate upon cold- and warm-blooded animals. Upon the first, minute doses (less than $\frac{1}{64}$ grain) slow the action of the heart by stimulating the peripheral cardio-inhibitory apparatus. Larger doses accelerate cardiac action, increase muscular contractility, irritability of spinal cord, and conducting power of motor nerves; they also slightly depress the excitability of peripheral sensory nerves. Still larger doses intensify these symptoms, lowering reflex action. Toxic amounts produce diastolic arrest of heart, loss of reflexes and of function of both sensory and motor nerves, and finally cerebral paralysis. On warm-blood animals, as dogs and rabbits, hyoscine at first diminishes and afterward increases the cardiac beats by a primary stimulation and a secondary paralysis of the peripheral cardio-inhibitory apparatus. Subsequently the drug diminishes the pulse by depressing the excitomotor apparatuses of the heart. The pressure is increased through stimulation of spinal and vasomotor centres; it is later depressed, owing to exhaustion of cardiac muscle. It retards respiration, diminishes secretion of saliva, depresses irritability of motor area of cerebral cortex, and lowers pathic sensibility. It causes prolonged dilatation of pupil, due to stimulation of sympathetic nerve. The drug has no action on peripheral or visceral temperature, nor does it accelerate the process of deoxidation of the blood. Its action would seem to resemble that of atropine, but it differs from this in that it depresses cerebral irritability. K. L. Pavloff (London Med. Recorder, May 20, '90).

Clinical effects of hyoscine resemble in

every way those of atropine. Gordon Sharp (Practitioner, Jan., '94).

Treatment of Hyoscyamus Poisoning.

—If seen early enough, emetics or warm drinks should be administered, followed by the use of the stomach-tube. Tannin and charcoal may be used if a stomach-tube is not at hand and absorption has not taken place. Among the antidotes advised are coffee, alcohol, pilocarpine ($\frac{1}{8}$ to $\frac{1}{4}$ grain), muscarine nitrate ($\frac{1}{30}$ to $\frac{1}{15}$ grain), morphine sulphate ($\frac{1}{8}$ to $\frac{1}{2}$ grain), or eserine ($\frac{1}{200}$ to $\frac{1}{60}$ grain). The violent action of the drug should be restrained by the use of the foregoing antidotes given by hypodermic injection, in moderate doses, and repeated at intervals, as indicated by the condition of the patient and the urgency of the symptoms.

Case observed in which $\frac{1}{10}$ grain of hyoscyamine produced thirst, a burning sensation in the throat, numbness, and loss of power. W. S. Thomson (Brit. Med. Jour., Aug. 25, '88).

Excessive dryness of the throat, prostration, and insomnia lasting through the whole night found after the ingestion of $\frac{1}{40}$ grain of hyoscyamine. J. A. West (Brit. Med. Jour., Sept. 22, '88).

The writer's personal experience with the $\frac{1}{100}$ grain of hyoscyne, followed, in two hours, by another dose of the same size recounted: Soon after the second dose, poisonous symptoms, consisting of extreme dryness of the mouth, muscular tremors, accelerated respirations, imperfect vision, mild delirium, and visual delusions, were present. There was also an intense desire to urinate, though the attempt was unsuccessful. The urine passed next morning was opaque and of a peculiar odor. All the effects of the drug had passed off in thirty-six hours, with the exception of sensitiveness of the eyes. W. A. Carey (Univ. Med. Mag., Apr., '89).

Case of poisoning with $\frac{1}{75}$ grain of the hydrobromate of hyoscyne in a very large man, weighing not less than 200 pounds. He was at the time in an irritable and

susceptible condition, and the drug was given for sleeplessness, which had resisted other hypnotics. In five minutes after the injection dryness of the mouth and throat were noticed, attended with a constant desire, but at the same time an inability, to swallow. In a few minutes his speech became thick and was accompanied by complete paralysis of the soft palate and upper lip, the latter being limp and immovable over the upper teeth, and gave the already much-impaired voice a muffled sound. The pupils at this time were noticed to be slightly dilated. S. W. Morton (Therap. Gaz., Feb., '89).

Hydrochloride of hyoscyne has produced erythema of the face lasting an hour or two. Magnan and S. Lwoff (Jour. des Soc. Scientifiques de la France et de l'Etranger, July 24, '89).

Case reported in which the administration of $\frac{1}{120}$ grain of hyoscyne hydrobromate to a patient with chronic intestinal nephritis and obscure brain-symptoms was followed by toxic symptoms. W. A. Edwards (Univ. Med. Mag., June, '89).

Case of poisoning by 6 drachms of the tincture of hyoscyamus observed, marked by symptoms very similar to those of belladonna poisoning. The respiration was, however, entirely unaffected. A. H. Dodd (Brit. Med. Jour., Sept. 21, '89).

Literature of '96-'97-'98.

Case of severe form of cystitis implicating both eyes and extending to the choroid and retina. Adhesions had already formed when the case came under observation. The inflammation lasted four months. Atropine, homatropine and cocaine, and atropine alternating with eserine were used with little or no effect.

One grain of the hydrobromate of hyoscyne was made up to a 1-per-cent. solution in water. Two drops of this solution were put into one eye, and as the patient felt no pain she put 2 drops into the other eye as well.

Five minutes afterward she complained of giddiness and a feeling of lightness in the head; she staggered, and had to be assisted to bed. Then great dryness of the mouth and throat with thirst supervened. The giddiness increased, gradu-

ally the senses became confused, and the power of speech was lost. Complete muscular relaxation became pronounced and she became rapidly unconscious. The breathing was slow and occasionally deep sighing. The face was flushed, the pulse full and regular.

This unconscious stage lasted for about four hours, and was succeeded by a period of semiconsciousness. At times the patient seemed to have perfectly recovered; at other times she was quite delirious. She talked incessantly, was occasionally irritable, although, on the whole, it took the form of a pleasant delirium.

After about two hours of this delirium she became gradually calmer, and then dropped off into a sound and seemingly natural sleep, which lasted for about an hour and a half. When she awoke she remarked that she had not slept so well for a long time. She had no remembrance of the events of the night further than being assisted to bed. There were no evil after-effects. The adhesions have stretched slightly. R. A. Morton (*Brit. Med. Jour.*, Feb. 8, '96).

Therapeutics.—The chief use of hyoscyamus is as a sedative to the nervous system. Spasmodic conditions, vesical pain and irritation, pertussis, and nervous coughs are relieved by preparations of hyoscyamus. In insanity hyoscine hydrobromate is given to allay acute or chronic maniacal excitement (by mouth, $\frac{1}{100}$ grain to $\frac{1}{80}$ grain; by injection, $\frac{1}{100}$ to $\frac{1}{90}$ grain). It is indicated in general paresis, melancholia, epileptic insanity, or quiet forms of mental aberration. In spermatorrhoea and nocturnal emissions hyoscine is of great value.

Hyoscine found more active than hyoscyamine. It appeared useless in chorea, athetosis, and whooping-cough, and to have but a weak hypnotic action in tabes. Its effects were most prompt in paralysis agitans and in senile and alcoholic tremor, but its influence is not lasting. It always produces a sense of fatigue, and flashes of light, dizziness, dryness of the throat, dilatation of the

pupil, and delirium are apt to occur. Buddee (*Deutsche med. Woch.*, May 17, '88).

For the tumultuous heart's action of Graves's disease application of ice to the præcordium recommended, and, for a general sedative, hyoscine hydrobromate. Taylor (*Med. News*, Dec. 16, 23, '93).

Several hundred hypodermic injections of a 2-per-cent. solution of the hydrochlorate of hyoscine given, and conclusion reached that for states of excitement and exaltation occurring in any psychosis whatever the drug surpasses all others. Its action is prompt and more certain than that of morphine, chloral, and paraldehyde. It is not a true hypnotic, since when given in acute mania it leaves the patient always awake, though it appears to make him exceedingly sleepy. J. Sagló (*Wiener med. Woch.*, June 2, '88).

Several hundred injections used in different mental disorders, and in conditions of excitement of a chronic form hyoscine is at times useful in doses of $\frac{1}{125}$ to $\frac{1}{66}$ grain, but it must not be given continuously for more than two to three days. In acute curable psychoses it is to be avoided as long as other remedies have any effect; and, if exhaustion of the strength is feared, the drug should be given at long intervals only. In affections of the heart it is never to be used. E. Konrad (*Centralb. f. Nervenheilk.*, etc., Sept. 15, '88).

The hydrochlorate of hyoscine, given hypodermically in doses of $\frac{1}{125}$ to $\frac{1}{48}$ grain, is very useful in maniacal fury, paralytic excitability, and the extreme restlessness of the melancholic. It was also successful in insomnia when chloral and morphine had failed. Fischer (*Lancet*, June 30, '88).

Three thousand single doses of hyoscine given internally to 88 patients with different varieties of mental disease. In 82.2 per cent. the hypnotic effect was very satisfactory. Never any ill effects seen, except occasional dryness of the mouth and thirst. The first dose should be $\frac{1}{125}$ to $\frac{1}{66}$ grain, to be later increased as habituation occurs. Kny (*Münch. med. Woch.*, No. 13, '88).

Hypodermic injections of the muriate

of hyoscine used in 90 cases of insanity. The effect of the drug does not appear so soon in paralytics as in maniacal patients. It has no influence on pulse or respiration. The dose employed was $\frac{1}{60}$ grain, and no bad results were at any time seen, excepting vomiting in one instance. Kraus (Orvosi Hetilap, No. 16, '88).

Hyoscine found most reliable as a brain-sedative, especially valuable in delirium tremens. Bruce (Amer. Jour. of the Med. Sciences, Oct., '88).

The writer's experience has been entirely unfavorable with hyoscine both as a sedative and as an hypnotic. John J. Weaver (Lancet, Nov. 2, '89).

When hyoscine is given in small doses it does not act as an hypnotic, but as an excitant to cerebral action. There seems to be no disposition to form the habit. It is a safe remedy in $\frac{1}{20}$ to $\frac{1}{15}$ -grain doses, repeated, if necessary, in two hours. This dose, however, is an unsafe one if the hyoscine be pure. E. B. Potter (Buffalo Med. and Surg. Jour., Sept., '89).

Hyoseyamine, from $\frac{1}{120}$ to $\frac{1}{60}$ grain, found to be a safer, more certain, and more efficient hypnotic in acute mania than hyoscine in similar doses. Lemoine (Le Bull. Méd., p. 1008, '89).

Hyoscine never fails to act as a prompt and powerful sedative in cases of mental excitement, and no bad after-effects follow. Walter S. Coleman and J. Taylor (Lancet, Oct. 12, '89).

In asylum practice hyoscine has largely supplanted morphine in the treatment of acute mania, the violence of acute melancholia and of general paresis, and as an hypnotic in general. It is remarkable for the absence of untoward after-effects. Hyoscine is most serviceable in cases of cerebral disease requiring an anodyne. After the administration of small doses of hyoscine in suitable cases the sleep produced is quiet and refreshing, and the system remains free from the after-headache, nausea, hebetude, and constipation that follow in the wake of opium and other narcotics.

Administration of hyoscine of value in cases of senile trembling, paralysis agitans, and fibrillary agitation. In cases of

chorea, and of various spasmodic affections of the nervous and respiratory systems, hyoscine may be given hypodermically, in doses of from $\frac{1}{300}$ to $\frac{1}{100}$ grain. Roberts Bartholow (Med. News, Dec. 12, '91).

Chloride of hyoscine to be given in doses of $\frac{1}{64}$ to $\frac{1}{22}$ grain. In various forms of chronic psychoses, in which other narcotics had proved themselves of no value, the drug was continued as long as six months, with but slight interruption, and gave, as a rule, eight hours' rest. In 25 per cent. of the cases, however, it could not be used, either on account of the dryness of the mouth, because the patients became accustomed to its use, or because an exciting instead of a quieting effect was produced. Oringe (Hospitalstidende, vol. ix, No. 16, '91).

Hyoscine believed to be most valuable as a mental alternative in nervous disorders, in which it must be given in small, and, if necessary, repeated doses. Hyoscine, however, must not be used indiscriminately, as its abuse will do more harm than good. It was found of no value in mental depression. The author uses the drug in doses of from $\frac{1}{300}$ to $\frac{1}{100}$ grain, increasing it cautiously up to $\frac{1}{50}$ grain. He advises a sterilized solution, with 5 grains of boric acid to the ounce, and recommends as antidotes, in cases of poisoning by it, pilocarpine and caffeine. Lionel Weatherly (Jour. of Mental Science, July, '91).

Tried in five cases of hystero-epilepsy, and it was found that it would abort an incipient attack and one already developed, a dose of $\frac{1}{64}$ grain usually being sufficient. Tolerance was not established. Bela Nagy (Pester Medicinisch-chirurgische Presse, Nos. 8, 9, '94).

Literature of '96-'97-'98.

Hyoscine employed in a case of angina pectoris believed to be of neurotic origin, with excellent results. Ostwick (Med. Rec., May, '97).

Hyoseyamus has anodyne powers and has been used in griping pains and neuralgias, and is often added to purgative pills to lessen the griping effect. It has

been used with success in strangulated hernia, its effects—anodyne and antispasmodic—serving advantageously to overcome the constricting ring in mild cases.

Case of strangulated inguinal hernia in which reduction could only be accomplished after the patient had taken, dosimetrically, 30 granules of hyoscyamine and the same number of granules of sulphate of atropine, followed by 45 grains of chloral-hydrate in 1 ounce of the syrup of morphine. Lemarié (*Jour. of Med. and Dosimetric Therap.*, Apr., '91).

Left crural hernia reduced, after taxis had failed, by means of belladonna ointment and ice to the tumor and the internal administration, frequently repeated, of hyoscyamine and strychnine. Berruyer (*Jour. of Med. and Dosimetric Therap.*, Apr., '91).

C. SUMNER WITHERSTINE,
Philadelphia.

HYPERMETROPIA. See **HYPEROPIA**.

HYPEROPIA, OR HYPERMETROPIA.—From Gr., *ἐπέρ*, over, and *ὥψ*, sight, was proposed by Helmholtz. Later Donders introduced the root *μέτρον*, measure, into the word, changing it to “hypermetropia” to make it correspond with other terms introduced by him as ametropia and emmetropia. The term is often replaced by the abbreviation H.

Definition.—That error of refraction in which the principal focus of the dioptric media lies behind the retina. Rays parallel when they enter the eye tend to focus behind the retina and are intercepted before they come to a focus: the eyeball is too short from before backward.

Symptoms.—If the hyperopia is of very high degree the eyeball is usually small in all directions, appears deep set, and noticeably fails to fill the orbit. The

pupil is small from contraction of its sphincter, associated with excessive exertion of the accommodation. Through a similar association there may be convergent squint, either constant or occurring when the attempt is made to see near objects clearly.

When the power of accommodation has been lost, as by age or the use of atropine, vision is imperfect at all distances. With sufficient accommodation clear vision is possible by excessive exertion of the ciliary muscle. This causes headache, most frequently frontal, sometimes occipital. Strain of the accommodation also causes chronic or recurring conjunctivitis, redness or inflammation of the lid-margins, styes, etc. The use of accommodation to correct the hyperopia leaves less for the focusing of near objects. Hence presbyopia appears early, requiring the use of convex lenses for near work before the age of 45. In high degrees continuous near-seeing may be impossible even from childhood, or objects may be held very close to the eye to make up for imperfect focusing by enlarged retinal images. In old age the convex lenses needed are stronger than would be required for failure of accommodation alone. The eye-strain may lead to inflammation of the choroid, optic nerve, or retina. The defect tends to give a distaste for reading and other occupations requiring near vision.

Literature of '96-'97-'98.

Fact insisted upon that all are born hypermetropic, and that later on we become myopic.

In hypermetropia there are variations in degree under the influence of the power of accommodation, which have the effect of increasing the manifest hypermetropia as the years go by; others, again, by reason of anatomical changes in the eye, lead to diminution in the amount of hypermetropia.

This diminution of the hypermetropic condition is owed to a great law by virtue of which during infancy and youth nearly all eyes are subject to an increase in refraction. This phenomenon results in producing in the one class of cases a reduction in the amount of hypermetropia, and in others causing the appearance of emmetropia, and even of myopia, and even, occasionally, a progressive increase in the degree of the latter. G. Martin (*Recueil d'Ophthal.*, No. 8, '96).

Extreme hypermetropia is prejudicial to speech. In youth the effort made to see distinctly at a short distance creates difficulty in finding the right word, and this difficulty persists during the whole life. De Haas (*Annales d'Ocul.*, Tome xvii, p. 56, '97).

Etiology.—Hyperopia may be due to flattening of the cornea or crystalline lens, making the focus of the eye unusually long: *hyperopia of curvature*. More commonly it is due to the antero-posterior axis of the eyeball being shorter than the normal standard: *axial hyperopia*. It may also be caused by the absence of the crystalline lens, as from injury or extraction for cataract: *aphakial hyperopia*. Hyperopia is usually congenital. Nearly all eyes are hyperopic at birth, and 70 per cent. continue so throughout life. It tends to increase after the age of forty years through the continued growth of the crystalline lens.

Varieties.—Hyperopia that cannot be corrected by the accommodation the eye possesses is called *absolute H*. That which is still corrected by accommodation in spite of efforts to relax the ciliary muscle is called *latent H*. That which can be revealed without use of a mydriatic (cycloplegic) is called *manifest H*. That which can be either corrected or revealed is called *facultative H*.

Diagnosis.—When distant vision remains equally good or is rendered clearer by convex lenses hyperopia is present,

and the strongest convex lens that allows clear distant vision comes nearest to measuring the hyperopia. The slightest hyperopia is rendered manifest by testing both eyes together, beginning with convex lenses that are too strong and making them weaker until distant vision is clear. To find its full amount it is often necessary in young persons to employ a mydriatic (cycloplegic).

With a convex lens before it the hyperopic eye can see clearly beyond the focal distance of the lens; and by sciascopy the point of reversal is found beyond the principal focus of the lens.

Treatment.—Hyperopia requires correction by a convex lens. Usually one strong enough to correct all of it is best. The lenses should be worn constantly if there is convergent squint, headache, or inflammation of the eye or its appendages. If symptoms only arise after use of the eyes for near work, wearing of the correcting lenses at such times may be enough. Diminishing the amount of near work required of the eyes may give relief. Persons who are hyperopic but suffer no inconvenience from the hyperopia require no treatment for it. Hyperopia co-exists with astigmatism in the majority of cases; and the very careful measurement and correction of both errors of refraction may be necessary to render the glasses at all satisfactory.

EDWARD JACKSON,

Denver.

HYPERTROPHY OF THE HEART.

Definition.—Increase in the thickness of the walls of the heart. The process may be general, affecting the entire organ. More often it is confined to, or predominant in, one side of the heart. The left ventricle is rather more often affected than the right. The amount of

muscular tissue in the auricles is scanty even when under the influence of hypertrophic changes.

Varieties.—*Simple* hypertrophy is associated with a normal size of the cardiac cavities. *Eccentric* hypertrophy implies enlargement of the cavities as well as thickening of their walls. *Concentric* hypertrophy—thickened walls encroaching on the cavities—is seldom, if ever, met with. (It is said to occur as a congenital condition. Its existence in any particular case should not be affirmed until by prolonged soaking in water all *rigor mortis* has softened.)

Symptoms.—It is astonishing how little subjective disturbance may be present, even when the hypertrophy is pronounced. To be sure, the enlargement is an attempt on the part of nature, as we shall see under ETIOLOGY, to avert symptoms; yet we wonder how the bulk and strength of the organ can fail, as they often do, to attract its owner's attention. There may be cardiac discomfort, throbbing or heaviness, especially when lying on the left side, but seldom any pain. Sometimes there are signs of cerebral hyperæmia: vertigo, tinnitus aurium, flashes of light, headache, and disturbed sleep. In a general way, it is fair to say that the more prominent the subjective symptoms are in any patient, the more likely it is that he has something more than pure hypertrophy: either a merging of the hypertrophy into dilatation or else some neurotic disturbance.

Objectively, we notice the pulse, the chest-wall, the epigastrium, and the heart itself. The pulse is regular and of good strength. It is usually not rapid, except in exophthalmic goitre. Irregularity and intermittence suggest failing compensation. The wall of the artery may be normal, but in many instances it

is rather stiff or presents the uneven ridges of calcification. It is said that in hypertrophy of the right auricle there may be such a regurgitation through the tricuspid valves (even if competent) before they completely close as to cause a venous pulsation in the root of the neck. This must be a rare phenomenon. Inspection shows a forcible, extended, and dislocated cardiac impulse. This may be powerful enough to render the thorax of a young subject asymmetrical, so that the lower part of the sternum and the ribs adjoining it on the left bulge forward. If the left ventricle is mainly affected, the apex is lower than normal and displaced to the left; if the right ventricle, the apex is displaced still more to the left, but it is not lowered. Enlargement of the right ventricle is evidenced also by pulsation in the epigastrium and in some cases at the right edge of the sternum. Universal hypertrophy, as seen in some cases of aortic regurgitation, lowers the apex to the seventh or eighth intercostal space and displaces it to the nipple-line, while the whole body jars under its powerful efforts like a small tug-boat with a large engine. Upon palpation the apex seems blunter than normal, and its impulse is slow and powerful, contrasting with the rather spiteful tap of dilatation. Sometimes the action of the auricles can be detected by the lightly-opposed hand. Percussion demonstrates an increased area of dullness, extending a trifle higher than normal, or even up to the second space, but exceeding the normal limits mainly in a lateral direction, one or two fingers' breadths to the right of the sternum, and as far as the nipple or the anterior axillary line on the left. Inasmuch as aortic regurgitation is sometimes associated with dilatation of the aorta, we may in this disease get dullness in the

second right interspace at the right edge of the sternum.

The first sound at the apex is dull and loud. It has a booming quality, contrasting with the valvular snap of hypertrophy. A reduplication of the first sound at the apex (gallop-rhythm) is ominous of beginning cardiac debility. At the base the first sound is not heard so distinctly as in dilatation, while the second sound is loud and clear, with strong accentuation of that valve (aortic or pulmonary) which corresponds to the obstruction that the hypertrophy is trying to overcome. For instance, in chronic nephritis the aortic second sound is accented, and, in right-sided hypertrophy, the pulmonic. In the presence of valvular lesions it need not be said that the murmurs caused by them more or less modify or replace the physiological sounds.

Differential Diagnosis.—Nervous palpitation does not give the sensation of strength in the cardiac impulse, although if long continued it merges into hypertrophy. The sounds are more valvular and have a certain "irritable" character.

Dilatation has a feeble impulse, coming against the chest with a weak slap. The first sound at the apex has less muscular quality than in health, while in hypertrophy the difference is the other way. In other organs we notice signs of failing compensation. There are dullness and moist râles at the base of the lungs or even hydrothorax. The liver is enlarged. Dependent parts are œdematous. The urine is scanty, high-colored, with an excess of urates and more or less albumin.

Care must be taken not to mistake a displaced heart for an enlarged one, whether the change in position be due to thoracic tumor, pleural effusion, or pressure through the diaphragm. Again,

the retraction of the lung because of chronic phthisis or failure to expand after pleurisy may expose a normal heart in an abnormal way. On the other hand, emphysema may mask actual hypertrophy. In a complicated case under my care a left-sided pneumothorax, limited by adhesions, acted similarly.

The area of dullness in pericardial effusion is triangular, with the base downward. That of a generally-hypertrophied heart is ovoid. Moreover, the feeble impulse and distant heart-sounds would at once exclude hypertrophy.

It is advisable in every case to establish the cause of the hypertrophy. When this can be done it confirms the diagnosis,—besides having a possible influence upon treatment.

Etiology.—Hypertrophy results from increased demands upon the circulation. An essential condition for its development is a fair degree of cardiac and systemic nutrition. A patient far advanced in phthisis cannot develop hypertrophy, nor will greatly-occluded coronary arteries supply to the myocardium the requisite material for new growth. The causes of hypertrophy may be enumerated as follows: 1. Obstruction to the general circulation, as occasioned by coarctation of the aorta, hypoplasia of that vessel, or compression of it by deformed chest-walls or tumors.

Considerable stress laid upon defective and incomplete development of the thorax in the etiology of pseudohypertrophies of adolescence. The deformity is characteristic, and consists in an elongation of the thorax, with constriction of the antero-posterior diameter. The heart is forced downward and the apex is sometimes felt as low down as the fifth intercostal space, giving the illusion of a true hypertrophy. The præcordial shock is unusually energetic. Huchard (*La Semaine Méd.*, Nov. 3, '94).

[The presence of the apex in the fifth

intercostal space in adolescents not considered abnormal. E. N. WHITTIER and H. F. VICKERY, Assoc. Eds., Annual, '96.]

Aneurism might be expected to cause hypertrophy, but it seldom does, unless associated with aortic regurgitation. Atheroma of the aorta is set down as productive of hypertrophy. It embarrasses the heart because it increases the friction of the blood-current and diminishes the elasticity of the artery. Conversely hypertrophy tends to produce atheroma by maintaining a high arterial pressure; so that the two conditions are apt to co-exist. Other things which increase the labors of the left ventricle and enlarge it are arteriosclerosis, acute and chronic nephritis, and, to a certain extent, pregnancy.

The connection between kidney and cardiac hypertrophy is attributable to primary toxicity of the blood. Dominicis (Wiener med. Woch., Nov. 17 to Dec. 1, '94).

In connection with the chronic granular kidney we have hypertrophy of the muscle and of the fibrous tissue belonging to the whole arterial system connected with the left side of the heart and of the muscles of the heart itself. Dickinson (Lancet, July 20, Aug. 3, '95).

2. A second class of the causes of hypertrophy includes those conditions which obstruct the lesser or pulmonary circulation, viz.: tumors, excessive pleural effusion, emphysema, chronic interstitial pneumonia, and some cases of phthisis. Orth states that some cases of chronic bronchitis exhibit a degree of hypertrophy of the right ventricle not accounted for by the amount of emphysema present. 3. Valvular lesions are sure to cause hypertrophy unless the patient is too feeble, or unless he is overwhelmed by the shock of their sudden development, as, for example, when a

cuspid of the aortic valves is torn off by violent exertion. More will be said about the valves under PATHOLOGY. Chronic adhesive pericarditis causes hypertrophy, particularly when, besides the obliteration of the pericardial space, there is adhesion of the outer surface of the pericardium to the pleura. Interstitial myocarditis is another cause. 4. Long-continued and severe muscular exertion—as exemplified in blacksmiths, iron-molders, coal-miners, and longshoremen—may endanger the heart; also prolonged or habitual mental excitement or worry, to some extent. 5. Somewhat allied to the preceding causes are exophthalmic goitre and excess in tea, coffee, tobacco, alcohol, and venery. Sometimes more than one cause operate in a single person. Laborious occupations affect much more severely the free drinkers than the total abstainers. Brewery-workmen illustrate this; although it may be that the effect of beer is due not merely to the alcohol it contains, but also to the large amount of liquid and to the carbohydrates dissolved in it, which would, in an excessive drinker, tend to keep the arteries at rather high tension.

In embryonic life, and for a time after birth, the heart grows by increase in size and by division of the muscle-cells. Later, the growth of the heart depends essentially upon the enlargement of the muscle-cells alone. In hypertrophy of the heart, produced by artificial lesions of the aortic valves, true dilatation of the left ventricle always precedes the hypertrophy. Hypertrophy may develop even when the general nutrition of the body is very unfavorable, and in hypertrophy the increase of the weight of the heart and of the transverse diameter of the muscle-cells is proportional. Tängel (Virchow's Archiv, June, '89).

Heart-hypertrophy follows any condition or set of conditions increasing the amount of work done by the heart. The

causes of heart-hypertrophy may be divided into two broad classes: (1) causes lying in lesions of the heart itself, interfering with proper function; (2) causes outside the heart.

The first class is subdivided into (*a*) lesions of the valves, and (*b*) lesions of the heart-wall. Of 105 cases of heart-hypertrophy valvular lesions were present in 13. Of lesions affecting the heart-wall there were found myocarditis, tuberculosis, and aneurism. In some cases of localized myocarditis there is a compensatory hypertrophy of other portions of the same wall. An aneurism of the heart-wall may throw out of function so large an area of muscle that the remainder must hypertrophy to make up for the portion lost. Again, an aneurism may be so situated in the heart-wall that the function of one or more of the valves may be interfered with.

The second class of causes of heart-hypertrophy may be subdivided into (*a*) causes acting directly and interfering mechanically with the contraction of the heart, and (*b*) causes acting by increasing the general arterial blood-pressure. Cases of the first class resolve themselves into pericardial adhesions. There were 8 examples of this lesion, and of these 4 were tuberculous.

In 7 out of 8 cases there were hypertrophy and dilatation of the right ventricle,—in most cases extreme,—and in 5 cases uniform dilatation of the whole heart.

Of the causes acting by increasing the general arterial blood-pressure, some offer mechanical obstruction to the blood-flow in territorial areas, others to the blood-flow in the whole general arterial system. To the former class belong (*a*) nephritis, and (*b*) pressure of tumors and the like upon vascular trunks.

There were 14 cases of left-ventricle hypertrophy associated with nephritis without arteriosclerosis. This number included only 1 case of acute nephritis.

Causes producing mechanical obstruction to the blood-flow in the whole arterial system include (*a*) the action of drugs and poisons (as alcohol, digitalis, and tobacco); (*b*) excessive work; (*c*) hydræmic plethora (including general

arterial hypoplasia); (*d*) cardio-nervous influences; (*e*) arteriosclerosis.

Arteriosclerosis was found to be by far the most common cause of left-ventricle hypertrophy. It is the most frequent of all causes of heart-hypertrophy due to conditions lying outside the heart, occurring in subjects over thirty years of age. Of the 105 cases of heart-hypertrophy from all causes, there are 62 cases dependent upon arteriosclerosis. Of these 62 cases, 38 had well-marked chronic diffuse nephritis, 17 slight chronic diffuse nephritis, 3 subacute nephritis, 1 acute glomerulonephritis, and 3 normal kidneys. Aneurism of the aorta occurred in 4 cases. In 20 cases there were valvular lesions. In most of these hearts the coronary arteries were dilated, thickened, and tortuous, and the seat of recent or chronic endarteritis. W. T. Howard (Johns Hopkins Hosp. Reports, vol. iii, Nos. 4, 5, 6, '93).

Hypertrophy is never primary, and dilatation always precedes hypertrophy in a hard-working heart, whether the increased labor be due to resistance from within or from without or to nervous stimulation and augmented action. J. G. Adami (Montreal Med. Jour., May, '95).

Statistics showing the proportion in which the various causes manifested themselves in 360 cases. Cardiac hypertrophy, due to some cause or other, was found to exist in no less than 105 cases. Of these arterial sclerosis was found to be the cause in 59 per cent.; chronic nephritis in 13.4 per cent.; valvular lesions in 12.4 per cent.; adhesions of the pericardium in 7.6 per cent.; excessive muscular work in 3.8 per cent.; tumors in 1.9 per cent.; aneurisms in 0.95 per cent.; hæmic plethora in 0.95 per cent. More than 50 per cent. of the cases of cardiac hypertrophy in general hospital work were due to arterial disease. Laflour (Montreal Med. Jour., May, '95).

The principal causes of cardiac hypertrophy other than disease of the valves and of the myocardium and adherent pericardium are as follow: 1. Organic changes in the arterial system, including obsolescence of the capillaries and also congenital narrowing of the arteries. 2. The overfilling of the circulation. 3. The

circulation in the blood of either foreign substances or an excess of substances which are found normally in small quantities. 4. Causes that act in a manner still unknown on the general or cardiac nervous system. The diffuse form of arteriosclerosis is rightly considered as, in many respects, the most important; the changes are wide-spread, affecting the whole arterial system to a greater or less extent. James Stewart (Montreal Med. Jour., Apr., '95).

Pathology.—The muscular fibres of an hypertrophied heart are increased in size somewhat, but mainly increased in

in thickness. The auricles are never very thick. The left in health is about $\frac{1}{8}$ inch and may become $\frac{1}{4}$ inch when hypertrophied. The right auricle is still thinner, and shows its tendency to hypertrophy by changes in its auricular appendix rather than in the rest of its cavity. Before measuring the walls, *rigor mortis* should be relaxed, as already advised, by soaking in water. Mere inspection may prove deceptive as to the existence or not of hypertrophy in cases of eccentric hypertrophy, because the



Fig. 1.—Excentric hypertrophy, due to adhesive pericarditis.

number. Macroscopically, the cut surface is red and firm. The extent of the hypertrophy can be determined by the size of the organ, the thickness of its walls, and its weight. A normal heart should be of about the same bulk as the closed fist of the subject. The wall of the normal left ventricle is about $\frac{1}{2}$ inch in thickness, and of the right $\frac{1}{4}$ inch, or a little less. The left ventricle seldom attains the thickness of 1 inch; the right may reach $\frac{3}{4}$ inch, and it has been reported as being even more than an inch

walls may look relatively thin and yet be absolutely hypertrophied. Weighing is a valuable procedure. The normal heart weighs 8 or 9 ounces. In disease the organ may weigh 1 pound or $1\frac{1}{2}$ pounds, and exceptionally 3 pounds, *i.e.*, as much as the liver!

[*Description of cuts:* Fig. 1. Excentric hypertrophy as a result of chronic adhesive pericarditis in a man aged 26 years. Weight of heart with pericardium, 1328 grammes (44 ounces). Valves competent. Wall of left ventricle $2\frac{1}{2}$ centimetres thick; of

right ventricle 5 millimetres. Patient of Dr. F. C. Shattuck, at one time under the care of the writer. Specimen due to the courtesy of Dr. J. H. Wright.

Fig. 2. Boy aged 6 years, in the writer's wards with excentric hypertrophy due to mitral regurgitation. The black line indicates the extent of cardiac dullness. Two attempts to obtain a radiograph were unsuccessful. HERMAN F. VICKERY.]

Of course, the immediate effect of any of the causes of hypertrophy is manifest in the corresponding portion of the heart, and not in the whole organ. Aortic stenosis and regurgitation enlarge the left ventricle. In time, however, stasis is produced in the pulmonary circulation, and the right ventricle also hypertrophies. Valvular lesions, whether regurgitant or obstructive, cause an appropriate part of the heart to hypertrophy, and then, sooner or later, more or less directly (with one exception) entails increased labor upon all the other portions of the heart. The exception is mitral stenosis, which affects the left auricle, the right ventricle, and the right auricle, and then tends to cause stasis in the general venous return, with consequent obstruction to the outflow of blood from the left ventricle and aorta into the arterial capillaries; but this obstruction to the expulsive efforts of the left ventricle does not result in hypertrophy of that portion of the heart, because so little blood is admitted into it through the stenosed mitral valve.

The greatest hypertrophy occurs in aortic regurgitation (*cor bovinum*). There is first eccentric hypertrophy of the left ventricle. When this reaches sufficient size, there arises relative insufficiency of the mitral valves, and thereupon hypertrophy of the left auricle and the right side of the heart.

The inevitable result of hypertrophy

is eventual debility and failure. By the time of death dilatation may far surpass hypertrophy; or the hypertrophied muscle may be more or less changed by fatty degeneration. In some cases the muscular condition is apparently so good that the pathologist surmises failure of the nervous mechanism to be the terminal factor in the case.

Prognosis.—As just stated, the condition must terminate unfavorably. So long, however, as the hypertrophy compensates for the obstacle which rises to it, or grows proportionally with any augmentation of that obstacle, the patient



Fig. 2.—Excentric hypertrophy due to mitral regurgitation.

may feel perfectly well. Even during this time of perfect compensation he may, however, suffer from cerebral hæmorrhage or (if the hypertrophy affects the right ventricle) pulmonary hæmorrhage. Escaping these dangers, he may do well for years, but finally dies, either from dilatation or fatty degeneration or the failure of innervation already mentioned.

Treatment.—The care of a patient with hypertrophy demands that we should allow nothing to aggravate the condition, and should in every way possible promote the nutrition of the myocardium. The etiology must be con-

sidered. Tobacco and alcohol must be forbidden and excitement and worry averted. Simple, nutritious food should be taken regularly in moderate quantity. It would be better to permit lunches than the ingestion of a large amount at one time. Moderate and habitual exercise is beneficial. The exact amount and character may be determined partly by the experience of the patient: dyspnoea and palpitation are not to be caused by it. If there is discomfort and throbbing in the left chest, bromides may be useful, or a drop or two of tincture of aconite, or veratrum viride, thrice daily. In a stout patient an occasional saline purge may be useful.

Treatment for hypertrophy itself is out of place, and the restriction to low diet or the use of aconite is sometimes dangerous. We have really to consider not the treatment of hypertrophy, but the treatment suggested by the hypertrophy. It may be necessary to diminish the volume and improve the quality of the blood by appropriate diet, hygiene, and tonics. It may be desirable, also, to diminish the resistance of the arterio-capillary network by aperients, eliminants of various kinds, and by relaxants of the arterioles and capillaries, such as nitroglycerin and the nitrites. By these means the work thrown upon the heart is reduced, and, if necessary, the heart may also be strengthened by strychnine and digitalis. Broadbent (*Lancet*, Mar. 21, '91).

Blood-letting at times, of life-saving usefulness, when the right side of the heart becomes engorged and overdistended by increased obstruction to the flow of blood through the lungs or left side of the heart,—a condition not rarely observed in intense bronchitis, especially when complicating emphysema, pulmonary oedema, and incompetence or stenosis of the mitral orifice are present. J. E. Atkinson (*Maryland Med. Jour.*, Dec. 29, '94).

In arterial tension, opium and iodides are followed by a rebound when taken for weeks or months. This can be pre-

vented by giving short courses of sodium salicylate to carry off accumulated uric acid, the cause of increased arterial tension. A. Haig (*Therap. Gaz.*, Sept. 16, '95).

Mercury is valuable far beyond its supposed alternative action. Its special benefit is exercised in dilated and hypertrophied heart. To give digitalis a fair chance, preliminary doses of mercury are absolutely necessary. William Murray (*Lancet*, Sept. 28, '95).

Engorgement of the portal system is almost always present in heart disease. Mercurial purges given in long-continued small doses are of the greatest importance in these cases: $\frac{1}{50}$ grain or even $\frac{1}{100}$ grain of corrosive sublimate with tincture of the chloride of iron will effect revolution by aiding true heart-tonics. Adonidin, cactus, convallaria, or others of newer remedies are of no real value. Satisfaction in real heart trouble is only obtained with nitroglycerin, strophanthus, and digitalis. Horatio C. Wood (*Cleveland Med. Gaz.*, Aug., '95).

The treatment of cardiac hypertrophy is much the same in all cases, regardless of cause. Walsh and Page are in accord as to the great value of aconite—1 drop every two hours until its effects are manifest. Page deprecates digitalis, recommended by Walsh and Osler as a cardiac stimulant, when valvular trouble is present, broken compensation being the signal for its use. The latter authors are also in accord regarding the value of blood-letting, Osler emphasizing the fact that with signs of dilatation—as indicated by gallop-rhythm, urgent dyspnoea, and slight lividity—venesection is, in many cases, the only means by which the life of the patient may be saved; 20 to 30 ounces of blood should be abstracted without delay. Strümpell practically advises the same remedies as Osler. When compensation has been established, Strümpell recommends baths ranging from 90° to 93° F., which are well borne by the patients and exercise a peculiarly beneficial and invigorating influence upon the heart. F. W. Campbell (*Montreal Med. Jour.*, June, '95).

The following method of treating cases of dilatation and hypertrophy resulting

from overexertion advised: In marked cases rest in bed. Stimulants, such as brandy, wine, ether, etc., tend to irritate the organ. Digitalis is very useful in many cases. The use of strophanthus preparations and the ordinary medical cardiac stimulants in addition to digitalis may be employed. Calomel affords great service after the other cardiac remedies fail. Narcotics and hypnotics are to be used with great care. Ice-bags are of doubtful value. Blood-letting is to be recommended. The use of aerated beverages is to be avoided. Hermann Rieder (*Deutsche Archiv. f. klin. Med.*, B. 55, p. 8, '95).

A daily cool bath, with rubbing, is a good tonic. Hot baths and Turkish baths are unfavorable or dangerous.

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HYPNOTISM.

Definition.—Hypnotism is a subjective psychical condition, composed of hypnosis, a pseudosleep-like state, in which the subject's natural susceptibility to suggestions is increased, and usually a post-hypnotic period of varying lengths, during which certain acts, suggested by the hypnotist while the subject was in a state of hypnosis, are performed.

[According to Moll, "A person in a hypnotic state is called an hypnotic, or subject. A hypnotist is a man who hypnotizes for scientific purposes. A hypnotizer is a man who makes hypnotism a profession." J. T. ESKRIDGE.]

A post-hypnotic suggestion is a suggestion made during the period of hypnosis for the patient to follow out after the stage of hypnosis has passed away, and the subject has returned to apparently normal consciousness. It is probable that, during the time in which post-hypnotic suggestions are actually being followed out, the subject is in a state of partial hypnosis.

Inducing Hypnosis.—There are sev-

eral methods by which hypnotic sleep may be induced. When these have been divided into two classes they have been termed the physical and psychical.

[The latter I prefer to call the suggestive method, and is the one that I usually employ except for very nervous, self-conscious, or hysterical subjects. I shall only briefly refer to some of the physical methods of inducing hypnosis, and then describe in greater detail the one I commonly employ, as I found it attended with least nervous strain to the subject hypnotized. J. T. ESKRIDGE.]

It is well for the patients to avoid, during the induction of hypnosis, as well as during the hypnotic state, everything that tends to excite or increase their nervous tension. Hypnosis may be induced by requesting the patient to fix his eyes intently on some bright object—such as a button or a lighted candle held a short distance from the eyes, a little to one side and nearly on a level with the top of the head—until the eyes close from fatigue, when the hypnotic condition may be completed by the hypnotist making passes with his hands from above downward. The hands need not be in actual contact with the patient, but the operator should stand in front of his subject and the stroking should be from the upper portion of the face downward as low as the hips or knees. Braid often resorted to the above method. Staring at a spot on the ceiling or at revolving mirrors has been successfully employed to induce hypnosis. The eyes must be held in an uncomfortable and strained position. The best position for this is looking upward and slightly to one side.

[Professor Charcot employed at times, especially for the hysterical, a sudden flash of an electric spark, the noise of a loud-sounding gong, or a stern command to go to sleep. He also modified the Braid method by placing pieces of glass close to the bridge of the nose. This

procedure causes strong convergence of the eyes and quickly produces sleep, but it often throws the hysterical subject into a cataleptic condition. He induced hypnosis in some by pressure on an "hypnogenic" or "hysterogenic" zone, such as an ovary or the top of the head. It is said that if a powerful magnet is brought near some hysterical subjects it will cause sleep. J. T. ESKRIDGE.]

After an hysterical person has been hypnotized a few times her staring intently at her own image in a mirror may cause hypnosis, the patient remaining in a cataleptic condition. Some employ a species of fascination by requesting the subject to look the hypnotist fixedly in the eyes until suggested movements are made or spoken commands are performed. The effect of the fascination is apparently increased if the subject grasps the hands of the operator while each stares in the other's eyes. If the hypnotist presses on one or both ears of the subject or firmly holds the eyelids closed and exerts gentle pressure on the eyeballs, through the closed lids, hypnosis may result, especially if the person operated upon is endeavoring to concentrate his mind intensely on some subject.

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To successfully effect hypnosis some co-operation on the part of the patient is necessary. This may be essentially passive, but it is the inability to resist that constitutes the neurotic stigma. A. A. Eshner (Phila. Polyclinic, Dec. 11, '97).

[The first person whom I ever hypnotized I did so without intending or thinking of hypnotism at the time. The subject unintentionally and involuntarily went into a profound state of hypnosis. J. T. ESKRIDGE.]

Realizing the dangers that may result from practicing hypnotism by the physical method (although, as is readily seen, no method is purely physical) and the

unpleasant medico-legal questions that might arise against the hypnotist in the employment of this method, I have adopted almost exclusively the following: I first explain to the patient that hypnosis, as I endeavor to induce it, is nothing more than a condition into which the person voluntarily places himself by allowing his mind to follow my suggestions to the exclusion of every other thought. That I have not and never shall have any power to put him to sleep without his consent and desire. That after I get him to sleep I can make suggestions which he will carry out in his normal or awakened state without thought or voluntary effort on his part, and by this means I shall, to a great extent, be able to keep his mind off himself or his ailments. After the patient has comprehended what I desire, he is placed in a comfortable posture, either sitting or reclining, preferably the former, when I request him to close his eyes and think of sleep as I suggest the phenomena to him, telling him that the whole matter is in his hands and I have nothing to do with his sleeping except as I suggest its phenomena which he must try to realize that he is experiencing. I endeavor in every case to free the patient's mind of any thought of the mysterious. I now request him to think of sleep, of his going to sleep, and repeat two or three times: "Your eyelids are getting heavy; you begin to feel drowsy; your head feels full and heavy; you experience an increased sense of drowsiness and a stronger inclination to sleep; your eyelids are getting heavier; you are feeling more and more drowsy; your arms begin to feel numb, sleepy, heavy, and powerless; a sleepy sensation is passing over your entire body and legs; my voice seems farther and farther off; now it appears to be far away, and to come from a great

distance; your eyelids are now decidedly heavy, and you are going into a deep and soothing sleep; now you are asleep and cannot waken until I tell you to do so; you cannot open your eyes." If the patient does not succeed in opening his eyes on my requesting him to do so, but at the same time positively assuring him that he cannot open them, I begin to make the necessary therapeutic suggestions in regard to his ailment.

A combination of two or more of the different methods of inducing hypnosis is often desirable and may be necessary to hypnotize the very nervous, the apprehensive, the self-conscious, and the hysterical. I have not employed any but the suggestive method for a number of years, although I have frequently failed by this means in hypnotizing subjects that I am sure could have been put into an hypnotic state by the use of other methods. Many of these, I am equally sure, would have been benefited by therapeutic suggestions made while they were in a condition of hypnosis.

[I hesitate to use any means that may be employed to deprive a person of consciousness against his will. I have never hypnotized a woman except in the presence of a third party, and for a number of years I have refused to hypnotize anyone unless a third party was present. After I have hypnotized a woman I always suggest that she will never come to my office alone. J. T. ESKRIDGE.]

Awaking the Subject from Hypnosis.

—The patient should never be awakened suddenly or in a state of agitation. One of the simplest methods is to suggest to the patients that they are gradually awaking and that within twenty or thirty seconds they will be wide awake with eyes open and feeling first rate, etc. One may suggest that the subject will gradually awake and then blow gently on the face. The eyelids may be raised and the patient called by name.

Susceptible Subjects.—All persons are not equally susceptible to hypnotic influences and some apparently cannot be hypnotized at all. A number partially yield to hypnotism, but to an insufficient degree to make them follow out suggestions. When hypnosis is attempted by the operator suggesting to his subject the natural phenomena of sleep, those that are ordinarily termed hysterical and those that are intensely self-conscious are not easily hypnotized. On the other hand, when the physical, or Charcot, method of inducing hypnosis is employed, the hysterical, provided they are not at the time greatly agitated by their own thoughts and apprehensions, are readily hypnotized. The somnambulists, or sleep-walkers, yield most readily of all subjects that I have encountered. Those trained to unquestioning and implicit obedience, such as sailors and soldiers, make excellent subjects, as a rule.

[I have found that the Latin races are more easily hypnotized than the inhabitants of the northern portions of continental Europe, or the Englishman, Scotchman, Irishman, or American. J. T. ESKRIDGE.]

Too great a desire or an overanxiety to be hypnotized, amounting to a fear lest one may fail, not infrequently prevents one from yielding to hypnotic influences. Those that can concentrate their thoughts on suggestions to the extent of subjectively realizing that what the hypnotist is saying is really taking place are readily hypnotized. Disturbed attention from any cause greatly interferes with hypnosis. As a rule, the laborer and the chronic hospital invalid will yield more readily than the mentally active. It is a mistake to conclude because a person is hypnotizable that his mental power and attainments are poor, for many who are mentally strong are easily hypnotized after they have determined to yield to

the hypnotic influence. Anything that interferes with the physical comfort of the subject or disturbs his thoughts will render him more difficult to hypnotize than when he is pleasantly affected by his surroundings. On the other hand, soothing influences, mental or physical, favor hypnosis. An uncomfortable position of the body of the subject, a room that is overheated or too cold, a strong light, an attack of indigestion, pain, an overloaded stomach, the stimulating effects of alcohol, coffee, tea, or the nervous effects of a strong cigar increase the difficulties in inducing hypnosis. Likewise mental agitation, emotional excitement, worry, apprehension, pre-occupation of the mind, and self-consciousness have a similar influence. Hypnosis is favored by bodily comfort, twilight, a darkened room, music, the presence of fragrant flowers, and freedom from all influences that tend to prevent the mind from following a suggested train of thought. A fair amount of intelligence seems to be necessary for the induction of hypnosis. It is impossible to hypnotize the lowest grade of idiots. It is extremely difficult to induce hypnosis in the insane.

[After repeated efforts in trying to hypnotize a number of insane persons I have not a single success to record. Voisin claims to succeed in hypnotizing the insane. J. T. ESKRIDGE.]

Some are hypnotizable at one time and not at another. Some persons may not yield to hypnotism at the first attempt, but do so after repeated trials. A number, especially the hysterical, cannot be put to sleep by the suggestive method, but will rapidly go into a cataleptic state on employing the means usually used by Charcot and his followers. Some experimenters succeed in hypnotizing 80 or 90 per cent. of their subjects, while others cannot claim success in nearly so great

a proportion; so that much depends upon the experience, the methods, the patience, and the individuality of the hypnotist.

SEX.—Personally I have succeeded in inducing hypnosis in a greater proportion of male subjects than of female. Liébault and others have been able to hypnotize a larger proportion of their female subjects, although the difference is not great in favor of the susceptibility of the latter. The hysterical are often hypnotizable by the Charcot method, while they will rarely yield when the suggestive one alone is employed.

[I have not used the former method for a number of years, and this may account for my failure in inducing hypnosis in the extremely nervous and hysterical. J. T. ESKRIDGE.]

Cases of failure are probably due to conscious or unconscious resistance on the part of the patient, or to inability to fix the attention. Hysterical subjects are more difficult to hypnotize than others, while the insane usually cannot be hypnotized. A. Liébault (*Le Sommeil Provoué*, p. 310, '89).

AGE.—Persons from about the sixth or seventh to the twentieth year make the best subjects for hypnotism. It is usually extremely difficult to hypnotize a child under four years of age. Middle-aged and elderly persons often readily yield to hypnotism, but, as a rule, they do not exhibit such a susceptibility as is generally found between the years of seven and twenty.

CLIMATE.—Residents of warm and tropical climates are said to be more easily hypnotized than inhabitants of colder countries. I have had no experience with the former except after they have immigrated to Colorado. Among our foreign population here the French and Italian are the most susceptible.

In estimating the proportion of persons who are hypnotizable many modify-

ing circumstances have to be taken into consideration. Not the least of these is the personal influence of the hypnotist. Some may be hypnotized by one person and not by another of equal experience. He who succeeds in getting his subject *en rapport* with himself will usually be able to induce the hypnotic state.

It is, in the employment of hypnotism as a therapeutic agent, as it is in the use of other aids to effect a cure, the personal equation of the hypnotist that plays a part of no small importance.

As a general rule, it may be stated that the oftener a person has been hypnotized the more easily subsequent hypnoses will be effected. In very nervous, self-conscious, and hysterical subjects, when only the suggestive method to induce hypnosis is employed, it often happens that the first attempt at hypnosis nearly succeeds, and that at every subsequent effort of the operator the failure is more and more pronounced, until finally no approach to hypnosis can be obtained. It is probably best not to rely entirely upon the suggestive method in inducing hypnosis in this class of subjects.

[In those cases in which I have succeeded at the first sitting in getting the patient thoroughly hypnotized, never have I failed of complete success in a subsequent attempt at hypnosis, provided the subject was in a good condition. It is a curious experience with me, it may not be new to others, that dipsomaniacs, during the time the intense desire for alcohol has been upon them, have not completely yielded to the influence of hypnotism nor have followed suggestions made at these times, notwithstanding I had often succeeded in completely hypnotizing them between their periodic drinking-bouts. J. T. ESKRIDGE.]

AS TO WHETHER A PERSON CAN BE HYPNOTIZED WITHOUT HIS KNOWLEDGE OR CONSENT OR AGAINST HIS DESIRE.—If the suggestive method only

is employed in inducing hypnosis we are justified in affirming that a person cannot be hypnotized without his consent and voluntary co-operation. When one or a combination of the so-called physical methods is used in inducing hypnosis the subject may not only be hypnotized without his consent or desire, but against his wish in the matter.

[Pertinent to this subject Björnström says: "It certainly is true that a conscious and willing co-operation promotes sleep, but a number of cases are on record where the sleep appears unexpectedly, unconsciously, and against one's will." J. T. ESKRIDGE.]

Hypnosis: its Degrees and Variations.

—A clean-cut and terse description of hypnosis is very difficult, as the condition varies in different subjects, being modified to some extent by the normal temperament of the subject, his mental and physical condition at the time, the depth to which the hypnosis is carried, and the method employed to induce it. The ordinary subject, when hypnotized by the suggestive method, especially if every precaution is taken to soothe the patient and prevent his becoming nervous and excited, sits or lies as one in a quiet and peaceful sleep,—*the somnambulistic state*. Temperature, pulse, and respiration vary little from the normal; the face is usually slightly flushed; the voluntary muscles are relaxed and the head and limbs assume the positions forced by gravity. If the subject is nervous, apprehensive, or excited, and one of the so-called physical methods is employed to hypnotize the patient, the limbs may become rigid—*the cataleptic state*—or he may go into a profound and stuporous sleep,—*the lethargic state*. The latter condition is not produced primarily by startling the patient, by means of striking a loud-sounding gong, by the sudden flash of an electric spark, or by a stern command to

sleep, such as will cause the cataleptic state suddenly to develop; but is produced by staring, or by pressure upon the eyeballs effected by means of the fingers held gently against the upper eyelids. Charcot recognized three stages, viz.: (1) *the cataleptic*; (2) *the lethargic*; (3) *the somnambulistic*.

I shall not take up space here in describing the cataleptic (see CATALEPSY) and the lethargic conditions. The somnambulistic state is the most interesting, both for psychological and therapeutic purposes. It is induced most typically by the suggestive method of effecting hypnosis, although it may be caused by any method that affects the imagination, especially by staring. It may be brought about secondarily from the cataleptic or lethargic condition by the operator gently pressing or rubbing the subject's head. The insensibility to pain found in the somnambule is usually the result of the suggestion that the patient cannot feel pain, although it sometimes occurs without any voluntary suggestion on the part of the operator. There is no increase of muscular irritability, similar to what is found in the lethargic state. If the hypnosis is slight the muscular tone is nearly normal, but if it is deep the muscles are relaxed; yet slight muscular contraction can be caused in some cases by exciting the cutaneous nerves over the muscles. The special senses and memory are sharpened during hypnosis.

[Many claim that the mental faculties generally are improved while the subject is in a somnambulistic state, but my observations have led me to believe that this apparent improvement can be accounted for by the heightened state of activity of the special senses. J. T. ESKRIDGE.]

For the most part the somnambule is largely deprived of his normal sponta-

neity, although he does often exhibit some power of reasoning, and performs certain acts that meet with his approval, and refuses to do other things because he seems to realize that they are unnecessary or improper. On the whole, the discriminating power of the somnambule is usually far below normal, and it can often be almost, if not completely, destroyed by repeated suggestions for this purpose, provided that the suggestions are made with discretion and the subject is positively given to understand that the thing suggested for him to do is right and proper for him under the circumstances.

Physical Effects of Hypnotism.—The cataleptic and the lethargic stages do not interest us here. Nearly all, if, indeed, not all, the altered conditions found in the organs of locomotion in hypnosis, induced by the suggestive method, are due to suggestion. If no suggestions are made the subject sits or lies as if asleep, and the limbs fall from force of gravity. If one succeeds in hypnotizing an extremely hysterical person by the suggestive method, and she be allowed to go into a cataleptic or lethargic state, then she may exhibit the phenomena common to these conditions. (See article on CATALEPSY.) By timely suggestions the hysterical can be prevented from exhibiting any cataleptic phenomena.

Nearly all the general and special sensory functions seem to be sharpened in a person while in a state of hypnosis, and those that are not affected by the hypnotic state may be increased by the proper suggestions. It is remarkable how acute the hearing often becomes. The subject at times will be able to tell what figures or letters have been written by some one in a distant portion of the room, while the other occupants can scarcely hear the motions of the pencil.

[I have never found one who has been able to read in this manner what has been written if several words or a few lines are written in small letters. I have repeatedly satisfied myself that hearing, vision, taste, and smell are increased, especially if the suggestion is made that they will be. J. T. ESKRIDGE.]

Temperature and pressure sensations are increased by suggestion. Power to feel pain may be present unless the suggestion is made that it will be absent, although I have found it absent when no voluntary suggestion has been made.

Persons soon become fatigued on putting them to severe tests to determine the capacity of their sensory functions. I have seen patients become exhausted, manifest great nervousness, begin to sigh, the face to flush, and profuse perspiration to appear after undergoing an examination of their physical or mental powers.

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In cases in which a patient, on being subjected to hypnotic influence, shows convulsive tremors, all hypnotic suggestion should immediately cease, and the subject should be wakened and advised to rest in the recumbent posture; a small amount of some gentle stimulant should also be administered. G. de Clive-Lowe (*Austral. Med. Gaz.*, Dec. 20, '97).

Psychical Manifestations in Hypnotism.—Of all the phenomena of hypnotism that of memory is the most pronounced and the most easily studied. The memory, as in the sleep-walker, or natural somnambule, is acute during hypnosis, not only for occurrences during previous hypnoses, but generally, both for the waking and sleeping states. Some persons affected with natural somnambulism remember during the somnambulistic state only what occurred during previous states of this condition and nothing of their normal states.

[So far as I have investigated, all persons in an artificial somnambulistic state retain a memory of all occurrences during previous hypnoses, a partial, and sometimes an accurate, memory of things that took place during their normal states. Most cases of hypnotism that I have carefully studied, unless I have made a suggestion to the contrary, have been able during their normal states to recall a few things that have been said to them during hypnosis, and as time elapses, they have, by effort, recalled much that has occurred while they were in an hypnotic state. J. T. ESKRIDGE.]

A suggestion during hypnosis to the effect that they will remember nothing that has taken place during this period causes memory to be a perfect blank after they are awakened. In like manner, if the suggestion is made during hypnosis that they will remember everything on awakening, the result will be as suggested. After the suggestion has once been made during hypnosis that nothing will be remembered on being awakened, nothing will be remembered after subsequent hypnoses until after the effect of this suggestion has been destroyed by a contrary one.

[I admit that memory is totally a blank or very imperfect in the waking state for what has occurred during hypnosis, but I have met with, as stated above, cases in which the subject could recall a few things that took place during the hypnosis if no suggestion had ever been made that nothing would be remembered. I, therefore, cannot agree with those who contend that all memory for occurrences of the hypnotic period is abolished in every case after the patient has been awakened. J. T. ESKRIDGE.]

While memory during the state of hypnosis is usually so acute and so accurate for all previous hypnoses, yet the hypnotist has it in his power, by simply suggesting to this effect, to prevent the subject in one hypnosis remembering

anything that has occurred during all previous hypnotic states. This has an important medico-legal value, and might prevent criminal acts of the unscrupulous to go undetected.

Another characteristic of the memory in hypnotism is the power unconsciously to remember things weeks, months, or probably years after they have been suggested, yet at no time during the period between the time when the suggestion was made and the moment at which the act suggested was carried out is the person able to recall the faintest idea of this latent memory; neither is he conscious that a suggestion has been made. During a subsequent hypnosis, after the carrying out of a post-hypnotic suggestion, the person is able to describe every detail in relation to the suggestion and its execution, but during the waking state nothing of it is remembered.

[I have a patient, a noted sleep-walker of this city, whom I have for a period of years hypnotized once every two or three months. During hypnosis I suggest to her that she will come to my office two or three months hence, on such a day and at such an hour and bring a friend with her. She has failed to appear at the appointed time only twice. On each of these two occasions she called me up by telephone at the time appointed for her to come, almost to the minute, telling me that she could not get anyone to come with her. I had previously suggested that she should never come to my office alone. Her friends have repeatedly asked her between these periods when she was going to visit me. Her reply has invariably been: "I don't know; when I am wanted, I suppose."
J. T. ESKRIDGE.]

The power of a person in an hypnotic condition to recite passages that they had simply casually read a long time before is often wonderful. While memory is usually very acute in this condition, I have found a few persons in whom it

seemed poor. All prolonged trials of memory during hypnosis are very fatiguing.

Diagnosis of Hypnosis.—It is not always possible to detect feigning. The relaxed and expressionless condition of the face, most typically seen before the hypnotist begins with his suggestions, the falling of the limbs and head by the force of gravity; the slow, labored, and jerky movements executed in carrying out suggestions are hard to simulate. A person feigning usually overdoes his part.

Dangers of Hypnotism.—So far as my reading goes there has been only one death recorded as occurring from the direct effects of the excitement incident to intense mental strain of a person in hypnosis.

[An account of the death and autopsy may be found in the *Journal of the American Medical Association* (Oct. 27, '94). The unfortunate subject was a neurotic female, who, after being hypnotized, was subjected to intense mental strain and requested to exercise clairvoyance while hypnotized. Her answers were not remarkable, considering the information given her by the operator, a non-medical man, but the strain proved too great and she collapsed and died in a few minutes. J. T. ESKRIDGE.]

Nearly all are agreed that the indiscriminate use of hypnotism or the employment of it by persons ignorant of the possible bad effects that may result from it, is highly reprehensible and should be forbidden by law. Much depends upon the methods employed to induce hypnosis. Repeated hypnosis, unless the greatest precaution is used, may result in weakening the ego of the subject. It does not seem to me justifiable to hypnotize for experimental purposes alone.

[He who resorts to hypnotism is dealing with a potent agent, and he should use it as carefully as he would a deadly

poison. No one would think of giving large doses of morphine or strychnine simply to study the physiological effects of these agents upon man. If these remedies are given for their therapeutic effects, then the resulting phenomena should be studied and recorded. J. T. ESKRIDGE.]

When it is necessary to employ hypnotism for the relief of some conditions, then it is justifiable, in my opinion, for the observer to study the physical and psychical effects. The hypnotized should never be subjected to prolonged physical or mental strain. Persons should not be kept in an hypnotic condition for days at a time. When the suggestive method of inducing hypnosis is employed, the same subject should not be too repeatedly hypnotized over a long period, and every precaution should be used, by suggestion and otherwise, to prevent any ill effects. It seems to me that hypnotism is only justifiable for therapeutic purposes in a limited number of cases.

Hypnotism regarded in the light of a physical force, as real as the currents of electricity and as potent for good in the relief of disease. Luys (*Jour. de Méd.*, Feb. 28; Mar. 7, 13, 20, '92).

The cases in which hypnotism should be used are very few. Charcot (*Berliner klin. Woch.*, June 3, '89).

Hypnotism is either useless or has only a temporary value in cases of slight functional disturbances, and in many patients it has an injurious action. Ziemssen (*Münch. med. Woch.*, Aug. 10, '89).

Hypnotism is often followed by injurious after-effects, such as nervousness, and even convulsions. Mendel (*Berliner klin. Woch.*, June 3, '89); Lombroso (*Le Bull. Méd.*, July 21, '89).

Hypnotism is apt to produce evil effects on the organism, and it especially favors and develops tendencies to hysteria. Germain Sée (*Ther. Gaz.*, Apr. 15, '90).

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Hypnotism is a pernicious practice, in that it lessens one's power of resistance.

and so degrades the patient both morally and intellectually. William James Morton (*N. Y. Med. Jour.*, Mar. 13, '97).

There is no doubt that the methods employed by Charcot and his followers—such as tiring the subject by gazing at bright objects held in such a position as to strain the eye-muscles, the sudden flashing of an electric spark before highly-hysterical subjects, frightening a nervous person by striking a loud-sounding gong hidden near her, or stamping the floor with the foot, and in a loud and commanding voice bidding the person go to sleep—may result in great nervous and mental strain, often throwing the subject into an hysterio-epileptic condition. Convulsions and insanity have followed such procedures.

As to whether some persons may possibly be hypnotized against their will, it is my opinion that these are mainly accidental cases and could rarely be used for the purpose of crime. No one can be hypnotized against his will if only the suggestive method of inducing hypnosis is employed. It is probable that after repeated hypnotic suggestions a person might be forced to commit a criminal act against his will or desire.

[A. Stodart Walker has recently detailed such a case, and says that he has met with more than a dozen experiences. J. T. ESKRIDGE.]

Therapeutics.—**PRECAUTIONS NECESSARY.**—As it is difficult to hypnotize the highly nervous and intensely self-conscious by the suggestive method, it is well to refrain from hypnotizing these subjects when it is possible to help them as much by other methods. When it seems imperative to induce hypnosis in them the suggestive method, combined with staring, pressure on the head, or stroking of the body should be resorted to. In all classes of subjects hypnosis should not be induced more frequently than seems

absolutely necessary. To prevent resorting to hypnotism too often it is well at each *séance* to suggest that the impressions will be lasting, and repeated hypnotizations will not be needed or desired by the subject. The latter should be cautioned against depending entirely upon the help of another, but encouraged to assert his will and become independent. Such suggestions should be repeated in a firm voice two or three times while the patient is in a deep hypnosis. Unpleasant or exciting suggestions should be avoided during hypnosis as much as possible, and if we are forced to use any such, their effects should be counteracted by the proper suggestions before the subject is allowed to awaken. It is better, as a rule, to suggest that the patient will remember nothing of what has been said during the *séance*. We should never allow ourselves to use suggestions to satisfy a morbid curiosity, neither should we inquire into the private affairs of the patient. The subject should always be told before being allowed to awaken that nothing but good can result from the hypnosis, that nothing but proper suggestions can be followed, and that he will feel better, less nervous, and refreshed on awakening. It is safer never to hypnotize a person, especially a female, except in the presence of a third party. The suggestion should be made during each hypnosis that no one shall ever be able to hypnotize the subject against his will, and not even then except in the presence of a third person. If any delusions have been suggested during the hypnosis they should be destroyed before the person is allowed to awaken. The awakening should be done in a soothing manner. It is well for most persons, if not absolutely necessary for all, to be aroused slowly, by being told that they are gradually awakening, and

will be wide awake in a certain number of seconds, feeling quite well, without mental or physical depression.

The value of hypnotism in each individual case depends upon whether the mental impression made by the hypnotist upon the subject in the state of hypnosis is capable of removing and taking the place of another mental impression of which the subject is possessed. I believe that the therapeutic influences of hypnotism are due to suggestions which are made sufficiently strong to become more or less permanent mental impressions. The mind of every normal person is in a more or less receptive condition, the degree depending largely upon the presence or absence of disturbing influences. We are constantly, when in contact with others, making and receiving impressions. It is not necessary for us to be hypnotized to be swayed to some extent by the influence of others.

[Tuke's work is replete with examples of this fact. Probably the reason why a person in a state of hypnotism is more susceptible to suggestions than in his waking or normal condition is due to the fact that the mind is freed from all influences at the time save those of the hypnotist. J. T. ESKRIDGE.]

We should not expect too much of hypnotism. At best it permits only of making suggestions more effective for good or bad than can be done upon one in his waking state.

[Elsewhere I have said: "It seems to me that much injustice has been done hypnotism as a therapeutic agent by the extravagant claims made for it by some conscientious physicians. Whether it has or should have a place in therapeutics we must decide after giving it a fair trial. So many of the results alleged to have been obtained by hypnotism seem so exaggerated that one is led either to doubt the honesty of the hypnotist or suspect that his judgment has

been warped by enthusiasm." J. T. ESKRIDGE.]

I have never seen a case in which a fixed habit of years' duration has been broken up by one or two hypnotic treatments, although many claim such a degree of success. In these cases my experience leads me to believe that repeated hypnotic suggestions extending over prolonged periods are necessary, and that even then the treatment will rarely be successful for periods of years. There will come times in the feelings of the alcohol or morphine *habitué* when the impulse to indulge is overpowering. Further, it must be remembered that scarcely any habit can be broken up by hypnotic suggestions unless the patient is desirous of getting rid of such a habit and fully co-operates with the hypnotist. The desire of the subject in his waking state and the influence of the suggestion made by the operator during hypnosis are both necessary in enabling a person to overcome such a habit as the morphine or alcohol, and even then they often fail, owing probably to the weakness of the will of the *habitué* when the temptation is at its strongest.

ANALGESIA.—Some contend that pain-anæsthesia does not occur spontaneously in hypnosis, but is the result of suggestion. Björnström seems to take it for granted that it is almost universal even without suggestion. My personal experience is that in numerous cases analgesia does not occur irrespective of suggestion, and in a few it is not complete after repeated suggestions to this effect have been made.

Were it not that we possess better and more reliable anæsthetics in chloroform and ether, hypnotism would to-day be extensively employed in surgery. It is only when the administration of an anæsthetic would be likely to be attended

with danger that there is any excuse to resort to hypnotism in surgical cases.

Hypnotism recommended for operations in the mouth, as the patient is able to swallow the blood, and thus escapes the danger of its falling into the respiratory passages. Forel (*La Semaine Méd.*, Aug. 14, '89).

Case of a patient who, under the influence of hypnotism, was operated upon with the most satisfactory results. It was a case of osteomyelitis in the upper third of the humerus, and required a painful surgical operation. Three days before the operation the patient was hypnotized six times, and was very well under control by the proper time. Edward L. Wood (*Med. Rec.*, Jan. 4, '90).

Hypnotism is of great value in children, and also in dental operations. In operations of some gravity, however, the fear of the patient outweighs any other influence, and hypnotism does not succeed. Osgood (*Internat. Dental Jour.*, June, '93).

FOR THE RELIEF OF LABOR-PAINS.—

Hypnotism has been employed by a number for this purpose. It is a very uncertain agent in these cases unless the subject has been hypnotized before labor begins. This often requires considerable time and patience, and a few inhalations of chloroform answer the purpose much better.

After employing hypnosis on thirteen patients in labor, the conclusion reached that hypnotism is an uncertain and inefficient anæsthetic, and produces a decided diminution in the force of the uterine contractions. Auvard and Secheyron (*Archives de Tocologie*, Nos. 1, 2, 3, '88).

ORGANIC DISEASE.—I have employed hypnotism in the treatment of organic diseases only in a few instances, and then on the earnest solicitation of the patients or their friends. Nothing further was expected in the treatment of these cases by hypnotic suggestion than the relief of certain symptoms, such as pain and despondency and the improvement of the

organic functions. In some instances despondency has been replaced by hope, pain assuaged, if it was not acute; sleep induced, the bowels regulated, and appetite and digestion improved. I must confess that I have seen very few cases of organic disease in which more was accomplished by hypnotic suggestion than could have been attained by other and less troublesome means.

[I have met with one case of cervical pachymeningitis of several years' duration in which pain and sleeplessness have been relieved for a period of nearly three years, although the patient was hypnotized only six or seven times. J. T. ESKRIDGE.]

The presence of the physician who inspires his patient with confidence and hope is a constant suggestion that health will be restored.

Out of 29 cases of organic disease of the nervous system, treated by hypnotic suggestion, only one cure was obtained, and that was doubtful. Pain and other symptoms may, however, be relieved. Van Reeterghem and Eeden (*Clin. de psycho-thérapie suggestive. Compte rendu des résultats obtenus pendant la première période bisannuelle*, 92 pp., gr. 8, '89).

Case of *tabes dorsalis* treated by daily hypnotism for about three weeks. In addition to local anæsthesia and partial loss of sight, there were severe pains in the chest and back, obstinate constipation, inability to walk more than half a mile, loss of appetite, insomnia, and great mental depression. The patient was hypnotized, and suggestions were made as to the bowels, digestion, sleep, and pains, the parts at the same time being gently rubbed. The following day the bowels were moved naturally for the first time in three months. After three weeks of treatment the patient's habits had greatly improved. The relief continued until the time of writing the report (about four months), although the disease probably progressed. Tuckey (*Lancet*, Aug. 24, '89).

Case of a man suffering with an ad-

vanced stage of disseminated sclerosis of the cord was so benefited as to be enabled to leave the hospital. The diagnosis was verified, as the patient returned within a year and died of tuberculosis. Fontain and Sigaud (*Lancet*, Aug. 24, '89).

Hypnotism and suggestion are useless in organic cerebral and spinal disease. Danillo (*St. Louis Med. and Surg. Jour.*, June, '89).

Case of infantile hemiplegia observed, in which improvement was produced after hypnotization for three months. The author believes that every person capable of displaying functional nerve-disturbance may be successfully hypnotized, and his experience led him to consider hypnotic treatment for organic lesions unsuccessful. J. H. Whitham (*Brit. Med. Jour.*, Feb. 28, '91).

FUNCTIONAL DISORDERS.—Gastro-intestinal disorders of a functional character may be temporarily and in some instances apparently permanently improved by hypnotic suggestion. At the suggestion of the operator the appetite increases and digestion improves.

[I have not undertaken to treat many of these cases by suggestion, and those that I have were mostly inmates of the County Hospital. The improvement in most instances was only temporary. When the loss of appetite and impaired digestion depended upon functional nervous states the effect of treatment was better. J. T. ESKRIDGE.]

It is easy by suggestion to cause the bowels to move at will, and often they will move at regularly suggested periods for days subsequently; but repeated suggestion from time to time is necessary to prevent a return to a constipated habit. Hypnotism is of little value in breaking up a costive habit except in those cases in which the habit is of short duration and due simply to a neglect to obey the calls of nature.

All the functional disorders of the nervous system do not improve by hypnotic suggestion. I have never suc-

ceeded in improving the condition of a typical hysterical subject by means of hypnotism, mainly from the fact that I have refrained from using any method to induce hypnosis in this class beyond the suggestive method, and none have become thoroughly hypnotized. Many experimenters—among whom may be mentioned Van Reeterghem, Eeden, Bidon, Stembo, Sperling, Bernheim, Danillo, Moll, Strübing, Mendel, Briand, Ringier, and others—report success in the treatment of a number of their cases of hysteria by means of hypnotic suggestion. What method they employed to hypnotize this class of their patients is not stated. Danillo acknowledges that most of his cases have relapsed after they had been helped or cured.

Those cases of hysteria in which the symptoms are many and quickly changing are less amenable to treatment than those cases in which there is some single severe symptom. Sperling (Deut. med. Woch., Oct. 31, '89).

In 40 cases of severe hysteria and other neuroses, 9 were completely cured and nearly all improved. In 164 slighter neuroses, 47 were cured, 37 markedly improved, and 39 slightly improved. Van Reeterghem and Eeden (Clinique de psycho-therapie suggestive. Compte rendu des résultats obtenus pendant la première période bisannuelle, 92 pp., gr. 8, '89).

Of three hundred cases observed more than one-third were hysterical. The author had good results in almost all from the use of hypnotism. It is indicated (1) in the spasmodic attacks of grave hysteria and the paralyses following; (2) in monosymptomatic hysteria; (3) in ordinary hysteria; (4) in hysterical insanity. Bérillon (Wiener klin. Woch., No. 4, '92).

Two severe cases of imaginary disease reported cured by suggestion. Both cases occurred in women: one of these imagined that she had paralysis of the legs, through paternal inheritance, and for nine years was actually confined to

bed and chair, from a supposed inability to walk. After so long a period of imaginary suffering, *one* single suggestion was sufficient to effect a cure. The other patient imagined that she had a tape-worm, and was cured when she was made to expel the imaginary animal. William B. De Wees (Kans. City Med. Index, Feb., '91).

My personal attempts favorably to influence epilepsy have been a failure, and this is in accord with the experience of others. I have had no experience in the treatment of chorea or paralysis agitans by hypnotism. Some report good results, but I suspect that the effect is temporary.

Literature of '96-'97-'98.

Functional neuroses of all kinds are favorably influenced by suggestion. The nervous disorders of writers and artisans yield in a short time, epilepsy and paralysis agitans excepted. Mental diseases are not at all, or but very little, influenced by suggestion. Alcoholism is. Suggestion can be used in various diseases for which one can find no adequate cause, as in insomnia and a great many pains. By producing local anaesthesia of the skin, one can do minor operations. Neurasthenic conditions in the sexual sphere are markedly benefited by suggestion. Louis Lichtschein (Med. Rec., May 2, '96).

I have seen a few cases of stammering greatly benefited by suggestion, but they have all relapsed. Insomnia yields quite readily to hypnotic suggestion if the subject is easily hypnotized. Repeated hypnoses are necessary for the relief of sleeplessness, and relapses are common. I have never seen any permanent benefit result to the neurasthenic. They are difficult subjects to hypnotize and the hypnosis is rarely profound. Neuralgia of a mild form and headache may be relieved in good subjects, but no permanent results are obtained without the removal of the causes. I have tried in

vain to relieve severe odontalgia and trigeminal neuralgia. Others claim great success.

In neuralgia the writer affirms that he has effected a permanent cure in about 10 per cent. of the cases treated by hypnotic suggestion. W. C. Delano Eastlake (Med. and Surg. Reporter, Sept. 5, '91).

Hypnotic suggestion practiced nearly fifteen hundred times, usually with very marked success. In various functional nervous disturbances, hysteria, insomnia, neuralgia, headaches, and in morbid mental states bordering on insanity decided benefit has followed its use. Frederick H. Gerrish (Boston Med. and Surg. Jour., July 21, '92).

Case of mydriasis cured by hypnotism. It was unilateral and disappeared after seven sittings. Three months later the other eye presented the same condition and was cured in the same way. Booth (Amer. Med. Surg. Bull., Nov. 1, '95).

Literature of '96-'97-'98.

Hypnotic suggestion acts upon specific cases of either pain or disability which depend upon morbidly persistent organic memories of pain or disability. Mary Putnam Jacobi (N. Y. Med. Jour., Apr. 9, '98).

INSANITY.—I have never succeeded in hypnotizing an insane person. Voisin, of Paris, professes to have hypnotized about 10 per cent., and asserts that good results have followed in some instances.

VICIOUS HABITS IN CHILDHOOD AND YOUTH.—A few years ago I had had no experience in the treatment of these cases. During the past three years I have hypnotized several of these subjects. The apparent permanent benefit in nearly all, except in those in which brain-power was very deficient, has been encouraging. Habits of lying, stealing, and masturbation have been broken up. I have repeatedly hypnotized all these subjects.

[C. L. Tuckey reports success in the treatment of such a subject with a bad heredity. J. T. ESKRIDGE.]

Case of sexual perversion cured by suggestion. Schrenck-Notzing (Jour. of the Amer. Med. Assoc., June 21, '90).

Hypnotism advocated as a means of correction and education for the vicious and depraved, especially the young. Twenty-two cases tried: 4 failures, 8 improvements, and 10 cures. Liébault (Revue de l'Hypnotisme, Jan., '89).

Hypnotism may be of inestimable service in the moral education of backward children. Brunnberg (L'Hypnotisme, jugé par les Spécialistes, '93).

Hypnotism is a powerful therapeutic agent in the treatment of onanism, spermatorrhœa, and various forms of impotence. Persistent erotic dreams banished in a single lady of 20 by this means after the sixth *séance*. Victor v. Gyurkovechky (Wiener med. Presse, No. 47, '92).

Four hundred and twenty-two cases treated by hypnotism with good results, the best effects being observed in diseases accompanied by pain. Treatment regarded as of great value in correcting vicious habits in children. Henry Hulst (Med. Rec., Mar. 4, '93).

THE ALCOHOL AND DRUG HABIT.—Although persons belonging to these classes ordinarily afford fair results, yet there are many discouragements and failures in their treatment by hypnotic suggestion. The subjects of these habits, except possibly the cocaine *habitué*, who is generally too nervous to become thoroughly hypnotized, are usually easily hypnotized, and for a prolonged period at first find little difficulty in following suggestions. One of the essential conditions for these subjects to be benefited by the treatment is for them to have a strong desire to break off their vicious habits. Suggestions made contrary to their desires have little or no effect. The dipsomaniac is least influenced by hypnotism. In one instance of this class, however, I have apparently succeeded in

getting rid of the inordinate desire for alcohol.

[Formerly, this patient was one of the worst dipsomaniacs that I have encountered. After treating him for nearly two years, and succeeding in lessening his bouts from ten or twelve to three or four a year, I then adopted the plan of suggesting to him that when he wanted alcohol he would ask his wife for it and drink at home. At the same time I suggested that he would drink nothing but beer and would not want more than one or two glasses of this, as he would feel nauseated, and would vomit. He now asks his wife for beer once or twice a month, takes one or two glasses, becomes very sick, but does not vomit. Subsequently the patient went to a saloon and began to drink, but he began to vomit and became so sick that he had his wife telephoned for to take him home.

In a number of cases I have succeeded in making the *habitués* vomit every time that they have taken alcohol in any form. J. T. ESKRIDGE.]

I have been able in a number of instances to remove slight functional menstrual disorders in subjects that were easily hypnotized.

Case of monoplegia of the left leg, with amenorrhœa lasting one year, cured by suggestion. Regnault (Le Bull. Méd., July 23, '93).

I have had no experience in treating nocturnal enuresis by suggestion. Others report success with these cases.

J. T. ESKRIDGE,
Denver.

HYPOSPADIAS. See URETHRA, DISEASES OF.

HYSTERIA.—Gr., *ἰστέρα*, the womb.

Definition.—Hysteria is supposed to be a functional psychoneurosis due to a morbid condition of the cerebral, spinal, and sympathetic nerve-apparatus, but apparently involving primarily the

cerebral cortex, and is characterized by mental, motor, sensory, vasomotor, and visceral disorders.

Varieties.—A sharp distinction must be made between hysterical manifestations and the disease known as hysteria. The fact is that all human beings and many of the lower animals may at some time, under peculiarly-trying circumstances, exhibit some of the manifestations commonly observed in hysterical subjects. A failure to draw a line of demarkation between *hysteria* and the accidental manifestation of the symptoms of the disease accounts for much of the differences of opinion in regard to the frequency of the morbid process. Some authors, and not a few neurological specialists, seem to regard hysteria as a comparatively frequent disease. My experience has taught me that the more carefully one studies his cases and the more patiently and thoroughly he examines into each symptom and analyzes it, the less frequently he meets with genuine cases of hysteria. A person sustains an organic lesion of some portion of the body, and during the progress of the disease manifests many hysterical symptoms, but after recovery from the organic disease there are no more hysterical symptoms. This is not hysteria, but the symptoms of it are the epiphenomena which have been added to the symptoms of the organic lesion. I have come to limit hysteria to those persons who, having a predisposition to the disease, develop its symptoms. Such a predisposition is more commonly inherited, but it may be acquired. For hysteria to become a disease the symptoms must be more or less continuous, usually remittent in character and frequently attended by paroxysms. Excluding all those cases in which hysterical manifestations are but the epiphenomena of other morbid

processes, I have found *true hysteria* very infrequent in the adult and still less common during childhood.

Symptoms and Diagnosis.—Multiplicity and variability characterize the symptoms of hysteria. There is not an organ of the body the functions of which may not be deranged in this disease. The symptoms may be as numerous as those that may arise from the perverted functions of every organ of the body. Fortunately no one case presents even the majority of the symptoms of hysteria. There are, however, certain classes of symptoms which characterize the disease, both during the paroxysmal and interparoxysmal stages, although only one or many of these are present.

Hysterical children often only manifest the mildest symptoms of the disease, unless subjected to some severe physical or psychical influence. They may remain emotional, oversensitive, depressed, show lack of the ordinary self-control, and yet manifest no distinctive stigmata of the disease for years. Indeed, the disease may never become developed in them, but by proper education and fortunate circumstances they seem to overcome, to a great extent, their natural tendencies to become hysterical. Many adults go through life burdened by the psychical soil of hysteria, but never develop the disease in a typical manner because they have never been subjected to causes sufficiently strong to overcome their power of resistance.

For convenience of study the symptoms of hysteria may be divided into two classes: (1) the interparoxysmal, which are more or less continuous and constitute the stigmata of the disease; and (2) the paroxysmal. The interparoxysmal symptoms may be studied under the following headings: Psychical, sensory, motor, and vasomotor.

PSYCHICAL SYMPTOMS.—These vary with the individual temperament of the patient, and are always present to a greater or less degree in every hysterical subject. Such a person seems defective in will-power, although Sachs observes that the will is more misdirected than weakened. The impulses of inclination are followed regardless of thought or reason. There is an increased impressionability and suggestibility; so that conscious impressions are more numerous than in health and suggest to the patient all kinds of fancies, whims, caprices, and perverted actions. In the worst cases self-control is lost, and, in all, it is impaired. The patient is irritable, unduly sensitive, and is annoyed by trifles. Self-consciousness is increased, trifles are magnified, the patient becomes emotional, and is easily elated or depressed, laughing and crying alternately without any apparent cause for either. The tendency to become discouraged and despondent is almost as great in some cases of hysteria as it is in melancholia. Some are painfully conscious of the action of every organ in the body. Every subjective sensation suggests the idea of a dreaded disease of this or that organ. Let an idea be suggested to the patient, especially if it relates to some physical or mental disability, and the thing suggested will likely follow. Thus we may often account for the presence of pain, paralysis, contracture, spasm, disturbance in sensation, and for various visceral derangements, especially of the heart, stomach, and kidneys. A multiplicity and variability of various kinds of subjective sensations are characteristic of hysteria, such as are rarely ever due directly to organic disease. We must remember, however, and too great stress cannot be laid on this fact, that we may encounter organic lesion of the

nervous system and hysteria associated in the same person, and that in many such cases the pronounced symptoms of the latter will obscure the less obtrusive evidences of the former, unless a careful search is made for them.

SENSORY SYMPTOMS.—Sensation may be abolished, increased, or perverted in various ways. The special senses are commonly affected when general sensation is involved. The general sensory disturbances may be classed as anæsthesia, hyperæsthesia, and paræsthesia. The special senses, except tactile sense, will be considered in a separate section.

Anæsthesia, next to hyperæsthesia, in some form is the most common sensory disturbance in hysteria. Few, if any, will indorse Gendrin's claim that in every case of hysteria, from the beginning to the termination of the malady, general or partial anæsthesia exists.

[On examining 400 cases of hysteria Briquet found some form of anæsthesia in 240. J. T. ESKRIDGE.]

The anæsthesia may be complete for all forms of sensation, it may affect one or more of the sensations, or there may be a simple lessening of cutaneous sensibility. It may extend over the entire body (extremely rare); it may involve one side of the body, hemianæsthesia (the most common form); the whole cutaneous surface may be anæsthetic except a few isolated areas; one or two limbs may be anæsthetic, the trunk escaping; sensation may be lost in an arm from the finger-tips to the elbow or to a point just below it (glove-anæsthesia); one leg may be similarly affected as high as the knee (stocking anæsthesia); or various anæsthetic spots or zones may be found in different portions of the body. Loss of tactile and pain senses is common. It is rare to find heat-sense alone absent. The power of localization

is frequently lost when tactile sense is disturbed. Muscular, joint, and pressure sensations are infrequently entirely lost, except in those cases in which all forms of sensation are abolished. It is extremely rare that some response cannot be obtained by the application of a wire brush attached to a faradic battery. Analgesia of all tissues, skin, bone, muscle, and nerve, is sometimes found. Tactile anæsthesia of the skin and mucous membranes is not uncommon in hemianæsthesia and total anæsthesia, although in these cases sensation is often partially or almost completely preserved around the anus, over the labia, to a less extent over the nipples, and immediately around the mouth and eyes. In hemianæsthesia the special senses of the corresponding side are often affected.

[According to Briquet, hemianæsthesia is much more frequent on the left side than on the right, the proportion being seven to two. J. T. ESKRIDGE.]

The following are the most important diagnostic features of anæsthesia of hysterical origin:—

1. In hemianæsthesia the loss of sensation is often profound, extending from the crown of the head to the sole of the foot.
2. The reflex action of the skin over the anæsthetic area is normal, or nearly so.
3. The pupils dilate when the skin of the neck on the anæsthetic side is irritated.
4. The fingers of the anæsthetic hand can still be used, without the aid of sight, in the performance of fine and dextrous movements.
5. When the arm or leg is affected the anæsthesia may cease abruptly at the shoulder or hip, or at the elbow or knee.
6. The ovarian tenderness is often greater on the anæsthetic side. The

other tender spots on the affected side usually persist, notwithstanding that analgesia over all other portions of this side is profound.

7. The loss of sensation may extend up to, or just beyond, the middle line in front, but may not reach the median line on the back.

8. The anæsthesia may come on suddenly as from traumatism; it may develop or increase after an hysterical paroxysm; it may increase during the examination or at the menstrual period; it is often changeable from day to day, and may be transferred from one side to the other.

9. The anæsthetic area ends abruptly. (The same thing is found in some cases of syringomyelia.)

10. In hemianæsthesia there is frequently a condition of "crossed amblyopia," the affected eye being on the side on which sensation is lost.

Hyperæsthesia and *hyperalgesia*, to a greater or less extent, are probably present in nearly every case of hysteria. The rarest form is in those cases in which there is an increased cutaneous sensibility over nearly the entire body. The next rarest form is unilateral hyperæsthesia. Commonly in cases of almost general bilateral or unilateral hyperæsthesia there are small areas of anæsthesia. The most common form of hysterical hyperæsthesia and hyperalgesia is that in which sensitive areas or points are found in various portions of the body. These have been termed "hysterogenic zones," because pressure over these points will often excite a convulsion or may cause it to stop if the pressure is made after it has developed. The sensitive points are usually found over the ovarian region, usually the left; in the left hypochondriac region; over the lower portion of the ribs; over the breasts, more com-

monly the left; the upper front portion of chest; on top of the head; on each side of the spinal column, and sometimes over various portions of the spine. Frequently numerous superficial sensitive points may be found over the abdomen, or the entire abdomen may be acutely sensitive to superficial pressure. In some cases the skin over the entire spinal column may be so acutely sensitive that the slightest touch causes the patient to cry out with pain. Spontaneous pain is often complained of in the intercostal spaces, over the heart, and over the entire spine, including the coccygeal region. In some cases the pain radiates up the cervical region of the spine over the back of the head. This symptom is very common in traumatic hysteria. The organs of special senses do not escape. Headache is a common and very distressing symptom in hysteria. The vertex is the most frequent seat of the pain, although it may be located in any other portion of the head, especially in the occipital, suboccipital, the temporal, or frontal region. Painful joints and neuralgic pains in various portions of the body are common in hysteria.

Hysterical arthropathy has sometimes led to unnecessary amputation. Intense pain and even swelling, and a light form of genuine arthritis, may be present. The excessive tenderness of the skin is an excellent diagnostic point. Anæsthesia is of great use in clearing up an obscure case. Those cases recover best in which no local treatment is adopted. Charcot (*Jour. de Méd. et de Chir. Prat.*, July 10, '91).

The following are diagnostic points in hysterical hyperæsthesia:—

1. The areas of increased sensitiveness are often ill defined, changeable, and may be bordered by areas of anæsthesia.

2. In hemianæsthesia the deep-seated

tenderness, or hysterogenic points, are most marked on the side corresponding to that on which sensation is lost.

3. When the pain or tenderness are superficial, deep and steady pressure, especially over the spine or abdomen, may give a sense of relief, after the excitement caused by the contact of the hand has passed away.

4. The painful joints may show no local changes, nor any other evidences of organic disease, and the patient is very averse to the slightest movement of the affected joint.

5. The presence of other stigmata of hysteria.

Paræsthesia.—Numbness is a common form of disturbed sensation in hysteria. This is often attended with "pins and needles" sensation. The skin may tingle or burn, or there may be a sensation of pricking. Some complain of a feeling likened to worms or other insects crawling under the skin. Others are troubled with a sensation as though water were being poured down the back, or allowed to drip drop by drop on the spine. The scalp and the brain are frequently the seat of all kinds of subjective sensations. Each organ of the special senses may apparently be the seat of perverted sensations, peculiar to the function of that particular organ. Paræsthesia may affect only one side of the tongue if it is unilateral in character.

The only diagnostic point to be gained by a study of paræsthesia of hysterical origin is that organic disease never gives rise to such a variable multitude of symptoms, especially of the character of those above mentioned.

The Special Sense-organs.—The eyes may be affected in various ways. They may be the seat of neuralgic pains. They may be so acutely sensitive that the patient is apparently unable to have her

room lighted without having her eyes covered. Hyperæsthesia of the retina is frequently increased by the attending physician allowing the patient to remain in a darkened room. A careful study of the vision, color-perception, the fields, and the action of the irises should be made in every case of hysteria. Total blindness of one or both eyes is exceedingly rare. The loss of sight comes on suddenly after a fit or a mental or physical shock. While the patient does not consciously see, and acts accordingly, yet by the proper tests it can be demonstrated that vision exists. Great care is required in distinguishing these cases from those of feigned loss of vision.

Literature of '96-'97-'98.

Three cases in which complete loss of vision in one or both eyes occurred without the presence of fundus changes or lesions of the optic nerve or brain, as far as could be detected, to account for it. Restoration of function occurred in all the cases. Alvin A. Hubbell (N. Y. Med. Jour., July 17, '97).

"Crossed amblyopia" is more common than amaurosis. In this condition in hysteria the vision is very slight and the fields are narrowed in the eye corresponding to the anæsthetic side of the body. In the opposite eye vision is lessened and the fields are impaired. The fields for perception may be lessened in three different ways: There may be bilateral homonymous hemianopsia (the blind fields on the right or left half of each eye, etc.); a central blindness (central scotoma); or a concentric narrowing of all the fields (the most common defect). Bilateral homonymous hemianopsia in hysteria is exceedingly rare, and the majority of careful observers have never seen a case. A sufficient number, however, has been reported, by most excel-

lent investigators, to demonstrate the possibility of its occurrence from functional cerebral disturbance. As found in hysteria, it has features which distinguish it from the cases that have an organic origin. It comes on suddenly, is usually transient, it involves the half of each field corresponding to the anæsthetic side of the body, with both conjunctivæ anæsthetic, and the other halves of the visual fields are greatly narrowed. The cases of hysteria presenting central scotoma show no changes in the retinæ. Concentric narrowing of the visual fields is frequent in hysteria, and this may take place to so great an extent that only extreme central vision remains.

"Hemiopia" may accompany ophthalmic migraine of hysterical origin, but in these cases it is always transitory, as is the migraine, and appears to be due to a temporary exaggeration of the concentric narrowing of the visual field. Gilles de la Tourette (*Annales d'Oculo.*, Oct., '91).

Color-perception is often greatly changed from the normal in hysteria. There may be a complete loss of color-perception, — achromatopsia; or there may be simply a disturbance of this, — dyschromatopsia. In the former condition everything has a grayish appearance, with an inability to distinguish one color from another. Dyschromatopsia is the more common defect. The normal color-fields from without inward are as follow: Blue, yellow, red, green, and violet. Thus, blue is the largest and violet the smallest. In hysteria red and blue may change places, so that red occupies the largest field. In narrowing of the color-fields the colors at first disappear in the order of their normal position, those occupying the smallest fields being obliterated, or "squeezed out of the centre" first. Violet is the first to

disappear, then green, but red remains, and is said to be the most persistent color in hysteria.

The color-fields are diminished in the order of their normal extent, and they may be lost in the same order: violet first, then green, red, yellow, and blue. Gowers ("*Diseases of Nervous System*," second ed., vol. ii, p. 994).

The fields, both for objects and colors, may remain entirely normal in hysteria.

Some of the following changes, so far as the field of vision is concerned, are likely to be present in cases of hysteria: (a) Simple contraction of the color-fields, with unaffected form-fields. (b) Contraction of both form- and color- fields, the green field being relatively more contracted than the others. (c) Partial or complete reversal of the normal sequence in which the colors are appreciated, most commonly that variety in which the red field is greatest in extent. Under these circumstances the color-fields may be normal in extent, sometimes even wider than is normal, or there may be an associated contraction of all the color-fields. (d) Unusual obscurations of portions of the visual field,—for example, in the form of an hemianopsia, or greater contraction of the fields on one side than on the other, the greater contraction usually being found on the same side with the anæsthesia. J. K. Mitchell and de Schweinitz (*Jour. of Nervous and Mental Dis.*, Jan., '94).

Monocular diplopia is not peculiar to this disease, as it occurs from organic disease of the brain. Hippus, or contraction and dilation of the pupils irrespective of light, has little diagnostic significance, as it is found in various depressed conditions of the nervous system. It should be borne in mind that the pupillary reflex is normal in hysteria, even in the cases of blindness or hemianopsia. Like the eye, the other organs of special sense are usually affected on the anæsthetic side.

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Possible disturbances of the ocular muscles that may occur in hysteria are: (1) disassociation of the movements of the eyes; (2) paralyses, which may affect individual muscles or associated groups of muscles; (3) contractures, which may affect individual muscles (spastic squint), associated groups of muscles (conjugate deviation), or both internal recti (convergent squint); (4) strabismus concomitans; (5) nystagmus; (6) conditions of paralysis or contracture of the muscles of accommodation; (7) conditions of paralysis or contracture of the muscles of the lids (blepharospasm, nictitatio, ptosis pseudoparalytica, etc.). Kunn (Wiener klin. Rund., Nos. 22, 23, 25, '97).

Points in the diagnosis of hysterical eye affections:—

1. If vision is lost or greatly lessened the patient acts as though she does not consciously see, yet by the proper tests it may be demonstrated that she does see.

2. In "crossed amblyopia" the worst eye is on the side corresponding to that on which the anæsthesia is situated, with or without paralysis or contracture, but the face is not paralyzed.

3. In homonymous hemianopsia both cornea are anæsthetic.

4. In dyschromatopsia blue may disappear before red.

5. In achromatopsia everything appears gray.

6. The presence of other stigmata of hysteria.

Hearing in some cases becomes so acutely sensitive that the patients are annoyed by ordinary sounds and by conversation. Unilateral deafness may occur alone, but it is oftener in association with affection of the other organs of special sense of the same side, which corresponds to the anæsthetic side. The deafness may be transferred to the opposite ear, with the transference of the an-

æsthesia to the opposite side of the body. The auditory canal and tympanum are anæsthetic. The loss of hearing is not always complete. The auditory nerve loses its normal irritability to electrical stimulation. Lloyd is in error in concluding that because the tuning-fork in hysteria can be heard better by aerial conduction than by bone-conduction it is a proof that the loss of hearing is psychical.

[The fact is that we can normally hear the vibrations of a tuning-fork through the air better and longer than we can through the bones of the head (Rinné). J. T. ESKRIDGE.]

The transference of the deafness from one side to the other by suggestion, the absence of evidence of ear disease, and the presence of other stigmata of hysteria are important aids in the diagnosis.

Smell and taste may be increased, lessened, or abolished on the side corresponding to the anæsthetic side of the body.

MOTOR SYMPTOMS.—Paralysis in some forms is not infrequent in hysteria. Probably the most common form is paralysis of the adductors of the vocal cords, producing aphonia. The paralysis may affect a few or many muscles. It may take the form of a monoplegia, hemiplegia, a paraplegia, or there may be almost a total paralysis, except of the face-muscles. It is often associated with contracture and anæsthesia. In many cases contracture is absent. When the paralysis takes the form of hemiplegia there may be hemianæsthesia, affecting all the special senses on the paralyzed side. In some cases of hemiplegia the anæsthesia is segmental in character. In monoplegia, if anæsthesia is present, it affects the entire paralyzed part or its distal portions. The same rule holds good in paraplegia. In hemiplegia the

arm is usually affected to a less extent than the leg. The face is probably never paralyzed in hysteria as it is in hemiplegia from organic brain disease.

Case of hysterical facial paralysis observed in a girl of 9 1/2 years. There was no other paralysis, excepting of the tongue, and no sensory disturbances.

Descroizilles (*Le Bull. Méd.*, Jan. 7, '91).

Ptosis of hysterical origin occurs occasionally, but it is not due to paralysis of the levator muscle. Paralysis may affect the tongue, pharynx, larynx, and œsophagus. Lloyd adds: "And even the anus"; but Gowers states that incontinence of urine or fæces never occurs. The paralyzed leg, when the hysterical patient is able to walk, is dragged as a heavy and almost useless limb. The paralysis is excited by trauma, a fit, or by some emotional disturbance.

Aphonia of hysterical origin usually comes on suddenly and spontaneously, so far as we are able to judge. The usual exciting cause is some emotion or a catarrhal condition of the larynx. The patient is able to whisper if the tongue is not involved, but when it is paralyzed voluntary articulation is lost. Such patients are often able to sing, and may talk aloud in their sleep, or while under the influence of an anæsthetic, yet be unable to utter a distinct articulate sound voluntarily.

Power in the limbs is rarely absolutely lost. The patient may be able to move the limbs in bed, but as soon as the erect posture is assumed the legs may give way at the knees. If the patient is able to walk the gait is shuffling, the steps short, but the front portion of the foot does not drop as in paralysis of organic origin.

On testing the strength of the weakened muscles in hysteria the extensor muscles contract more than in health, and this gives to voluntary muscular movements the appearance of the pa-

tient's intentionally resisting the force of flexor contraction. If the patient is requested to grasp the dynamometer with all her power the muscles on the back of the arm can be seen to contract, causing an irregular and jerky movement of the hand.

The nutrition of the muscles is well maintained considering that the muscles are not used. Electrical reaction is practically normal. In all cases in which the reactions of degeneration are found present there is some organic change in the nervous system to account for the phenomena. Gowers states that muscular irritability is normal in one-half the cases, but that it is slightly increased in cases in which spinal tenderness is present. In this condition the knee-jerks are excessive, and on tapping the patellar tendon the trunk-muscles contract and the patient experiences a sharp pain in the lower portion of the back. These phenomena I have seen especially well marked in cases of traumatic hysteria. The knee-jerks may be lessened, but they are rarely ever entirely absent. In those cases in which they seem to be absent they may be elicited if the precaution is taken to see that the flexor muscles of the knees are not contracted. True ankle-clonus is rare in hysteria except in cases in which the heel is drawn up by chronic contracture of the calf-muscles. Spurious ankle-clonus is not infrequent. On first pressing the foot upward there may be one or more slight, irregular movements of the foot; they cease, and in a few seconds begin again, but can be prevented by firm and continuous pressure of the foot upward.

True ankle-clonus is exceedingly rare in hysteria, but it does occur. I have been able to obtain it during the convulsion and in some cases of contracture of the calf-muscles.

The plantar reflexes are often slight or entirely absent in hysteria. The other superficial reflexes may be present or absent on the paralyzed side. No bed-sores form even in the bedridden cases.

Contracture frequently occurs in connection with paralysis of hysterical origin, but it may develop independently of it. The causes are usually those that give rise to paralysis. It may last minutes, hours, months, and in some cases even many years. The degree of contracture gradually increases after its beginning, although the condition developed suddenly. The nutrition of the muscles is not materially interfered with except in those cases in which the contracture is extreme and of prolonged duration. The opposing muscles of the contracted group are tense, so that the affected joints are held as in a vice (Lloyd). Sensation is often lost in the skin over the affected muscles or in the distal portions of the limb. In cases of contracture of the arm, leg, and face of the same side, there may be a condition of hemianæsthesia of the affected side, the face being turned toward the anæsthetic, paralytic, and contracted limbs. The anæsthesia in these cases usually involves the entire side of the body from the sole of the foot to the crown of the head. The special senses of the same side do not escape. Of the limbs, the arms are more frequently the seat of contracture than the legs. One or both arms may be affected. The hand, the wrist, or the entire arm may be involved. The contracture in the arm is flexor in character. The finger-nails may be buried in the palms of the hand, or the fingers may be flexed at the metacarpophalangeal joints and extended at the other joints, as in tetany. This is the only exception from the rule of flexor contracture in the hands and arms

in hysteria. The flexor contracture of the hand is not lessened by forcibly flexing the wrist, as is the case of contracture from organic trouble. In the legs, whether one or both are affected, the contracture is extensor in character, except that the toes are flexed. The heels are often pulled upward to such a degree by the calf-muscles that the dorsum of the foot is on a line with the front of the tibia. The feet are rigidly extended at the ankles, and the legs at the knees and hips. Contracture is said to involve one side of the face in some cases. I have never seen a case with hysterical contracture of all the muscles of one side of the face. Temporary contracture of the eye-muscles, producing strabismus, I have met with in a few cases. Contracture of the tongue-muscles occurs. The muscles of one side of the neck may be so affected as to produce a condition of torticollis. Contracture of the obicularis palpebrarum muscles may produce a pseudoptosis. This may be unilateral or bilateral. Sometimes the diaphragm is affected. In some cases a part of a muscle may be the seat of contracture, giving rise to the appearance of a tumor. Such pseudotumors have been observed in the calf, pectoralis major, and abdominal muscles.

Two forms of hysterical contracture exist, as follows:—

1. One concerns single parts and limited groups of muscles, and may last for years without organic change in muscles, joints, or interstitial tissues. In this form also sudden cessation of contracture is possible.

2. A form which attacks in succession one limb after another until nearly all voluntary muscles, including those of the trunk, may be affected.

These never get well abruptly, and in them muscles, joints, and areolar tissue undergo serious organic changes. In the first form the muscle-reflexes and me-

chanical and electrical reactions are but little changed, while in the generalized form late in the disease the reflexes are diminished or lost and the quantitative electrical reactions are decreased. It is only in this form, after years of life in bed, that changes in the cord are to be expected, and whether these are independent accidents or secondary products of the hysterical condition is not definitely known. S. Weir Mitchell (*Revue de Chir.*, Aug. 24, '95).

Ataxia.—Ataxia in hysteria is pronounced in some cases. It is usually greater than what is observed from organic disease, and the movements that the patient makes to maintain the upright posture are greatly exaggerated. *Astasia-abasia*, occasionally observed in hysterical subjects, is an inability to stand or walk, although the limbs are strong and can be moved freely in all directions while the patient is sitting or reclining. Choreoid movements of the hands, arms, or of different groups of muscles are often seen, especially in children or young adults. One shoulder is suddenly drawn up or the head is jerked to one side, backward, or forward. Sometimes the movements are shock-like in character. I have witnessed one case of hysteria in the male in which, on the patient's attempting to stand or walk, he would spin around like a top until he fell. Rhythmic or oscillatory movements of the head, trunk, or limbs sometimes occur in hysteria.

Tremor.—The tremor often seen in hysterical cases closely simulates that caused by poisoning from lead, arsenic, mercury, etc. Lloyd is probably right in the belief that the tremor in its early stage, due to these poisons, is partly hysterical in its nature. The tremor of hysteria may be rapid, 8 to 12 per second; medium, $5\frac{1}{2}$ to $7\frac{1}{2}$; slow, 4 to 5 per second. The majority of cases of tremor of hysterical origin cease during repose if

the patient is not watched, and all, even those that are continuous during repose, are increased in extent by muscular effort, although the rhythm does not change. On account of the influence of exertion on hysterical tremor the latter has sometimes been mistaken for the intentional tremor of disseminated sclerosis.

Hysterical tremor is more common in men, and may resemble every kind of tremor associated with organic disease. If the tremor appear after a fit, it is of special importance in determining hysteria. When the tremor diminishes, it may be increased by pressure on the hysterogenic points. Charcot (*Le Progrès Méd.*, Sept. 6, '90).

Tremor in hysteria may develop very insidiously or suddenly, under the influence of fright or moral shock, and still more frequently after a convulsive attack. It may begin with a true attack of trembling. In order to distinguish hysterical trembling from the trembling in Graves's disease, it needs the evidence of other symptoms of either affection. Dutil (*Nouvelle Iconographie de la Salpêtrière*, Jan., Feb., '90).

Hysterical tremors may be detected by certain common traits. These are of three types: the hysterico-emotional tremors, arising from fright, emotion, etc.; the hysterico-toxic tremors; and a purely hysterical tremor, consecutive to hysterical attacks. Their evolution is often characteristic, coming on after a shock and attended with headache and intellectual troubles. The tremors may vary in character, and are not infrequently of an anomalous type. Oddo (*Marseille-méd.*, Oct. 15, '91).

The hysterical patient will often touch an object, as a nail driven into the wall, without much difficulty, but after the finger has remained a few seconds in contact with the object the arm becomes affected with an irregular, jerky tremor, differing from the tremor of multiple sclerosis, in which great effort is frequently required in bringing the finger

in contact with a small object, but the tremor ceases as soon as this has been accomplished. (Buzzard.)

DIAGNOSTIC POINTS AMONG THE MOTOR PHENOMENA OF HYSTERIA.—1. In aphonia, etherization and faradization of the throat will cause the patient to speak. Talking during sleep may occur, and singing is possible in many cases. The aphonia may have come on suddenly after emotional disturbance of traumatism. Paralysis of the vocal cords is always bilateral in hysteria; unilateral paralysis is due to organic disease. The aphonia disappears suddenly.

2. In hemiplegia the face is not paralyzed, although it is often anæsthetic on the side corresponding to that of the hemiplegia.

3. The leg is dragged or shuffled, the foot is not swung outward in bringing it forward, and the toes do not catch on the ground or floor as is the case in hemiplegia from organic brain disease.

4. The nutrition and electrical irritability of the muscles are well preserved.

5. The deep reflexes may be normal, and the plantar absent on both sides. If the knee-jerks are increased, the difference between the two sides is not great. Absence of the plantar on one side rarely occurs in hysteria.

6. On testing the strength of the flexor muscles there is abnormal contraction of the extensor muscles of the joint.

7. The flexor contracture of the hand is not lessened by forcibly flexing the wrist as occurs in organic disease.

8. Ptosis of hysteria is not due to paralysis of the levator, but to spasm of the orbicularis, and the spasm is increased on requesting the patient to look up. If double, the head is thrown backward on trying to look upward. If the head is held by some one both orbiculares contract (Gowers).

9. The ataxic gait is exaggerated beyond that of organic disease, and has the same psychical character as the muscular movements of the hysterical convulsion.

10. Astasia-abasia, inability to stand or walk, is always presumptive evidence of hysteria.

11. The tremor usually ceases during repose if the patient thinks that she is not watched, but it sometimes continues while the patient is sitting or lying. Voluntary motion increases the tremor. If the patient is requested to touch with the index finger of one hand a small object, little difficulty is experienced in doing this, but after the finger has been in contact with the object a short time, irregular jerky movements of the arm begin, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with the object, but, this accomplished, the tremor ceases immediately (Buzzard).

12. It is probably safe to say that paralytic incontinence of urine and fæces never occurs, and the presence of incontinence of either should always arouse suspicion of organic disease.

VISCERAL AND VASOMOTOR DISTURBANCES.—In many cases of hysteria these symptoms become quite pronounced, and some of them may persist for a long time, and become troublesome, or even dangerous to life. The pharynx may become so irritable that deglutition is difficult or almost impossible on account of spasm of the pharyngeal muscles resulting from the presence of food. Besides the *globus hystericus*, spasm of the larynx may take place and greatly embarrass respiration.

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Functional dysphagia occurs more frequently in women than in men, but it is

not uncommon in the latter, and may appear in children.

There may be pain, or a sense of constriction, or a feeling of a foreign body in the gullet often at about the cricoid cartilage, or even higher. The condition may be associated with *globus hystericus* or other evidence of hysteria, or the dysphagia may be the only symptom. Where there is evident spasm of the gullet, this comes on in advance of the act of swallowing. A. Coolidge (N. Y. Med. Jour., Aug. 28, '97).

Indigestion in some form is common in hysteria, but that form which interests us most in this connection is that in which the stomach and bowels become greatly distended with gas. Peristaltic movements of the bowels may be greatly lessened and in some cases apparently reversed. A section of the bowel may become greatly distended and form a phantom tumor of the abdomen.

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Patient, male, aged 19 years, after a period of overwork, suffered so greatly from difficulty in breathing and palpitation of the heart, that he was obliged to remain eight weeks in bed. Later the curious symptom developed that with each inspiration the stomach filled with air, emptying again on expiration. The chemical and motor conditions of the organ remained normal and there was no sign of pyloric stenosis. Herz (Med. News, Jan. 1, '98).

Constipation may be so troublesome that neither brisk purgatives nor enemata have much effect. Vomiting often proves annoying and sometimes dangerous. It may occur almost immediately after the food is swallowed, apparently before it has reached the stomach (œsophagismus). In some cases after the food has lain in the stomach for some time considerable gastric pain and distress are complained of and the food is vomited. In such cases, especially when the subject is a young girl, as is often the

case, the symptoms of gastric ulcer are closely simulated and may cause some apprehension. Pure hysterical vomiting is unattended by nausea, and the patient does not show signs of exhaustion from the act. It occurs fifteen minutes to an hour or more after eating, and the whole contents of the stomach are apparently ejected; but probably this is rarely so, as the patient may show comparatively little emaciation, although vomiting may persist for weeks. The emesis may be purely mental, or it may be partially voluntary, for purposes best known to the patient. It is well known that malingerers may become quite expert at vomiting at will. It is sometimes difficult or almost impossible to determine how much the vomiting is due to psychological influence and how much to pure voluntary effort. In some instances the vomiting may be so persistent as to endanger the life of the patient by starvation, but this is extremely rare. Hysterical anorexia may be so great that the patient is unable to take sufficient food to maintain life. In those cases in which persistent refusal to take food is kept up for weeks or months and yet the patient does not greatly emaciate, it becomes evident that deception is being attempted.

Irregular and rapid heart-action is common in hysteria and is often a source of apprehension and distress to the patient. The pulse-rate may be 100 or 140 per minute, or even more. The patient often becomes faint on the slightest exertion, such as made in turning in bed or sitting up. Dyspnoea and pseudo-anginal attacks may occur from a little extra physical effort, or from emotion, especially fright.

Frequent co-existence of hysteria and cardiac affections noted more frequent in men than in women, especially in those suffering from mitral stenosis,

either alone or complicated with insufficiency. Hysterical præcordial pain, hysterical dyspnœa, and hysterical apoplexy should be carefully differentiated from similar symptoms due to cardiac disease. Giraudeau (*Le Semaine Méd.* June 26, '95).

Rapid respiration, from 40 to 80 per minute, may be of hysterical origin. In these cases the pulse-rate may not be correspondingly accelerated. An annoying hysterical cough is not an infrequent symptom in young girls. I have never witnessed a persistent and continuous rise of temperature, 3° or 4° F. above normal, in hysteria, but cases presenting this symptom have been reported by competent observers. Intermittent rise of temperature is not uncommon. A difference in the axillary temperatures of several degrees has been observed. We should always be on our guard in cases of supposed hysterical fever and endeavor to detect any deception that may be attempted. Retention of urine is not an infrequent symptom in some female subjects.

Incontinence from hysteria never occurs. It may be that those cases of incontinence that have been reported were either the incontinence of retention or the incontinence that sometimes occurs in healthy persons from a weakened condition of the vesicular sphincter as a result of allowing the bladder to become overdistended for several hours. Abundant secretion of light-colored urine of low specific gravity is common after any emotional excitement. Anuria may occur. Complete suppression may last for ten days, without the ordinary symptoms of uræmic intoxication. Gowers ("*Diseases of Nervous System*," second ed.).

Many vasomotor disturbances—such as local dilatation or constriction of the blood-vessels of the skin, flushing; unilateral sweating, especially of the head and neck; swelling of the hands or feet or of the joints—may occur in hysteria.

Case of ecchymotic spots and pemphigoid eruptions of hysterical origin. The ecchymoses appeared after a convulsive attack, and have persisted during two years. Raymond (*La Semaine Méd.*, Dec. 31, '90).

Attention called to an œdema with bluish discoloration, which at times occurs in hysterical subjects. The affection resembles, in some respects, Raynaud's disease, but is not symmetrical, like the latter, and does not lead to gangrene, as Raynaud's disease does. Charcot (*Jour. de Méd. de Paris*, Feb. 22, '91).

PAROXYSMAL SYMPTOMS.—The convulsion is the most prominent symptom of hysteria, and, while it does not occur in the majority of cases of this disease, it is the one symptom first thought of by many, especially among the laity, when the term hysteria is mentioned. The hysterical convulsion of the classical type, first described by Charcot, and further elaborated and illustrated by his industrious pupil, Richer, is of very infrequent occurrence in this country. Here the paroxysms assume numerous atypical and abortive types. There are great similarities and dissimilarities between the hysterical and the epileptic convulsion. Prodromal symptoms are often absent, or if present are not recognizable in epilepsy. In hysteria they almost invariably occur, and are usually so pronounced as to be observed not only by the physician, but by the patient and attendant. They often begin several days before the convulsion takes place in pronounced cases of hysteria. In the lighter forms of this disease, especially in those cases in which the paroxysm is caused by temporary physical exhaustion or emotional shock, the prodromal period does not extend over more than a few hours at most, and frequently it is apparently limited to a few minutes. After the exhaustion and excitement caused by

attendance upon a ball, in which the patient has danced until the early morning hours, the emotional disturbance following a lover's quarrel, a sharp disagreement with an intimate friend, or the receipt of sad news, the subject becomes excessively nervous, impatient, irritable, and breaks out into fits of apparently causeless laughter or crying. The emotional disturbance and loss of self-control increase, and soon an hysterical convulsion, immediately preceded by an aura, supervenes.

In the majority of cases of hysteria the prodromal symptoms extend over a period of two or three days. The psychological phenomena are the more prominent. The mood of the patient changes; she is depressed, peevish, irritable, nervous, and unable to pursue her ordinary routine duties. She often becomes less sociable, keeps to herself, seems to be absorbed in her own thoughts, and may show evidences of being suspicious or the subject of hallucinations or delusions. Personal habits change; from being neat and tidy, she neglects her person and her dress. In some instances there is great increase of motor activity and there may be maniacal tendencies; in others, the patient is mute, broods, and becomes melancholic. The appetite is capricious, lessened, or lost; the tongue is coated, the digestion poor, there may be nausea and vomiting, and the bowels are often constipated. Sometimes deglutition is difficult on account of spasmodic action of the throat-muscles, and in some cases there may be spasm of the œsophagus or of the larynx. The stigmata of hysteria, especially relating to the sensory and motor phenomena, may develop or increase at this time.

The convulsion is immediately preceded by an aura, most commonly from the ovary; next from the throat, the

globus; from the head, the *clavus*; or from any "hysterogenic zone." In the child the paroxysm may consist of a maniacal outbreak, with hallucinations or delusions; it may take the form of violent motional disturbance, inappropriately termed chorea major, attended with delirium and a tendency to break furniture; or it may be an epileptoid convulsion.

Hysteria may be present in very young children. The simplest form shows itself by exhibitions of anger without sufficient cause and crying. A more accentuated form manifests itself by the child's stiffening out its limbs, the face becoming violet and turgescient, with trembling of the whole body. Chamnier (*Med. Press and Circular*, Dec. 9, '91).

It is rare even in adults in this country to have the classical convulsion divided more or less distinctly into four stages. The first stage is known as epileptoid; the second, the period of grand movements; the third, period of passionate attitudes; the fourth, the period of delirium. In the hysterical convulsions that I have witnessed the first and second periods have been fairly well marked, but the third stages has been entirely absent, and only occasionally has the fourth period been present.

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There are three periods in a complete hysterical attack.

1. The preconvulsive period, in which the aura—mental, sensory, or ovarian—occurs.

2. The convulsive period, consisting of the tonic and the clonic spasms.

3. The post-convulsive period, of which the most striking feature is the delirium identical with the mental state which characterizes one or the other of the different varieties of hynosis.

In the first period consciousness and memory are always preserved, and injury which might occur during the second

period may be prevented by precautionary measures.

In the second period consciousness and memory are usually abolished, and the patient has no knowledge of the convulsions.

In the third period consciousness is usually preserved. He has knowledge of his movements, and yet when the attack is terminated he is ignorant of what he has said and done during this third stage.

Any one of the three periods may exist alone. A. Pitres (*Revue Neurol.*, Sept. 15, '96).

[The following is rather typical of hysterical convulsions as I have observed them. An hysterical female at 22 years, after presenting many of the prodromal symptoms for two or three days, complained of a sudden choking sensation in the throat, which she said was rising and choking her. She fell, or, rather, sank, to the floor, without hurting herself. The whole body and limbs became rigid and she shook all over as one with a severe chill. The legs and feet were extended, the arms flexed at the elbows, and the fingers were firmly flexed over the thumbs. The pupils were slightly dilated, but equal in size and responded fairly well to light. The eyeballs were rolled in different directions under the closed lids, but on raising the upper lids the balls turned upward and inward. The face did not change in color perceptibly, although the breathing stopped for at least 30 or 40 seconds. At the end of about a minute clonic, convulsive movements began in the arms; the legs were flexed and extended at the knees and hips a number of times, and the head was turned from side to side in a rhythmical manner. During the period of clonic movements, which lasted about eight minutes, the pupils and color of the face remained normal and the tongue was not bitten. The patient did not soil her clothes nor froth at the mouth. After the clonic convulsive movements ceased the patient lay as if exhausted. A pin-prick was scarcely recognized, and consciousness seemed greatly blunted, but on pressing over the left ovary the convulsive movements recommenced, and

these were followed this time by opisthotonos, rolling of the body from side to side, and various exaggerated movements.

In watching this case the psychological character of the movements was well marked, and the movements seemed almost voluntary. They were different from the reflex, forcible, shock-like movements of epilepsy. There was a rhythm in the movements which is never observed in the convulsive stage of true epilepsy. J. T. ESKRIDGE.]

There is, however, in many of the graver cases of epilepsy, especially in children and young adults, periods of maniacal excitement and hysteroid-like movements, which follow true epileptic convulsions. These may occur a few minutes, hours, or a day or so, after one or several epileptic fits. I have a case of epilepsy, in a girl 15 years old, under my care at present, in which maniacal outbreaks take place the first or second day after a series of convulsions. They have never followed a single convulsion in this patient.

There are many abortive and atypical types of an hysterical convulsion. A condition of ecstasy, somnambulism, catalepsy, trance, or lethargy may follow or even take the place of the convulsion. Charcot called attention to the fact that mental symptoms may take the place of the convulsive seizure. We may have no convulsion, but a condition of alternating consciousness, the abnormal state of consciousness apparently entirely replacing the convulsive seizure. I have one such case under my care at present.

It is important to bear in mind that firm pressure over "hysterogenic zones," especially over the sensitive ovarian region (?), will bring on a convulsion or may arrest it if the pressure is made during its progress. I have been able on two or three occasions to arrest an hysterical convulsion by forcibly pulling

and flexing one of the great toes. Many of the stigmata of hysteria, such as anæsthesia, contracture, and paralysis develop or increase soon after hysterical convulsions.

Limited space will not permit me further to discuss the paroxysmal stage of hysteria, although I have left many interesting points untouched.

Some points in the diagnosis of hysterical convulsions:—

1. The immediate cause of the convulsion is often some mental shock or physical exhaustion.

2. The patient sinks rather than falls to the floor, and rarely injures herself in sinking.

3. Pupils equal and rarely normal in size and respond to light. It must be borne in mind that strong and continued muscular movements will cause the pupils to dilate and will prevent their responding quickly to light.

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Attention called to the absence of the pupil-reflex in attacks of hysteria. Observations were made in the clinic of Professor Krafft-Ebing, who confirmed the diagnosis and the fact of the absent reflex. The latter was also confirmed by the ophthalmologist Bernheim. The observations were made by having the lids held apart, the eye being illuminated by a hand-lamp and the cornea protected by salt-solution. Thus the eyes could be observed for many minutes. The pupils were wide open and motionless for as much as twenty seconds. J. P. Karplus (Wiener med. Woch., No. 52, '96).

4. The color of the face remains practically normal. There may be a slight venous congestion of the face if the breathing ceases several seconds beyond the interval observed in health. This is in marked contrast to the changes observed in the color of the face in severe cases of epileptic convulsions.

5. The tongue is not bitten, unless it is injured in the fall; but this is rare. There is rarely blood and froth oozing from the mouth, and the clothes are not soiled by the discharge of fæces or urine.

6. Consciousness in some cases seems to be fairly preserved, usually it is blunted, and probably is never as profoundly lost as in case of epilepsy.

7. The muscular movements are psychical in character, *i.e.*, they seem often to be purposive in their nature, and lack much of that pure reflex act observed in epilepsy. In hysteria rhythm or frequency of the movements is maintained, but the force varies; in epilepsy the frequency lessens, but the force of the muscular contraction is kept up until the convulsive movements cease.

8. The hysterical convulsion is usually much longer than the epileptic. They may last from ten or fifteen minutes to an hour or more.

9. Pressure over a sensitive ovary or other "hysterogenic zones" will sometimes arrest the convulsion.

10. Co-ordinated and exaggerated muscular movements, apart from the rhythmical clonic convulsive movements, especially marked if restraint is attempted, form a large part of the convulsion.

Differential Diagnosis.—At the end of each heading, *sensory symptoms*, the *special sense-organs*, *motor symptoms*, and *paroxysmal symptoms*, or *hysterical convulsions*, will be found a summary of the principal diagnostic points of each group of phenomena. It is unnecessary to repeat them here.

In the vast majority of instances the diagnosis of hysteria is comparatively easy if one is familiar with all the *ear-marks* of the disease. Much precision and certainty is lost to that physician who regards hysteria as a protean dis-

ease, without certain constant and characteristic symptoms. While it is true that on superficial observation the symptoms of hysteria at times may appear to mimic those of nearly every organic lesion of the nervous system, viscera, and joints, yet, by a careful study of it, especially of the stigmata, their onset, course, and duration, it will be discovered that hysteria is a definite and distinct disease with its own laws and clean-cut symptoms, and that the mimicry is but so in appearance. It must never be lost sight of that hysteria and organic disease may be associated. The two diseases may exist in the same person at the same time. Indeed, in one who is strongly predisposed to hysteria the development of organic disease will give rise to hysteria. In such cases it is important to bear in mind that the pronounced and more obtrusive symptoms of hysteria may, and frequently do, overshadow, if they do not entirely obscure, the indistinct symptoms of organic disease. A failure to recognize this fact is, I am quite confident, to blame for many mistakes, and not a few blunders that I have encountered in the practice of some excellent physicians.

The first duty of the physician on meeting with a case that seems to be hysterical in character is to determine, if possible, by repeated, thorough, and systematic examinations whether or not there is any organic lesion present. The presence of a multitude of symptoms, all pointing to hysteria, are not sufficient to rest a diagnosis upon, if there is one symptom that positively indicates an organic lesion.

CORTICAL LESIONS OF THE BRAIN.—Paralysis and anæsthesia of the distal portion of a limb from a cortical lesion should never cause any difficulty in the diagnosis from hysteria, unless the patient is also the subject of the latter dis-

ease; yet I have seen cases in which this mistake has been made, in one instance, too, by a neurologist of no mean ability. In the first place, there is absence of the stigmata of hysteria. The paralysis and anæsthesia begin gradually, and the latter is rarely ever profound or extensive. If the lesion is irritative and attended by contracture, muscular wasting will occur. The spasm is at first limited and Jacksonian in character. The deep reflexes of the affected limb are excessively increased, while those of the other limbs may remain normal or nearly so. Soon other symptoms of organic lesion, especially choked disks and evidences of intracranial pressure, develop. The reverse of all these symptoms obtains in hysteria. In the event that the patient were hysterical the presence of the positive symptoms of a focal lesion of the brain would make the diagnosis clear.

CEREBELLAR TUMOR.—Most of the cases of tumor of the brain that have been mistaken for hysteria have been located below the tentorium. I have one such case under my care at present. This patient was treated eighteen months for neurasthenia and hysteria. It is fair to state that she comes of hysterical stock, and has the most prominent of the stigmata, even to the paroxysmal symptoms. A careful history, which revealed the fact that certain symptoms pointing to organic disease began gradually eighteen months ago and has since slowly, but steadily, increased, together with unilateral facial paralysis and double choked disks, make the diagnosis easy.

HEMIANÆSTHESIA FROM BRAIN-LESION.—This is extremely rare unless associated with some motor disturbance. The deep reflexes, especially the knee-jerk, are increased to greater extent than is found in hysteria; hemianopsia will likely be present and the special senses

on the hemianæsthetic side are less affected. In hysteria there is probably "crossed amblyopia." The hemianæsthesia that occurs in alcoholism and in some cases of metallic poisoning, especially from lead, is evidently hysterical in its nature.

HEMIPLEGIA.—The paralysis of one side of the face; the state of the reflexes, —the deep excessive and the superficial slight, or abolished, on the paralyzed side; the absence of "crossed amblyopia"; or profound affection of the special senses would exclude hysteria as the cause.

HEMIANOPSIA.—If due to organic brain-lesion in the occipital lobe this may be the only symptom, except, perhaps, pain in the head. It is not changeable and persists for a long time, if not for life. In hysteria it is transient, changeable, the other fields are narrowed, the conjunctivæ of both eyes are anæsthetic, the color-fields are probably reversed, and other stigmata of hysteria are present.

PARAPLEGIA. — If due to myelitis affecting the lumbar region, paralysis of the anal and vesical sphincters, the loss of the reflexes, muscular wasting, bed-sores, and the reactions of degeneration would stamp the nature of the trouble. If the cervical or dorsal cord or the lateral columns were the seat of the lesion the exaggerated reflexes with true ankle-clonus and other evidences of organic disease would serve to determine the character of the trouble. In poliomyelitis the muscular wasting, loss of reflexes, and the reactions of degeneration would exclude hysteria as the cause of the paralysis. Syringomyelia has many symptoms in common with hysteria, but the muscular wasting, often the weakness of the sphincters, the changes in the reflexes, and the absence of the stigmata of hysteria would be sufficient on which

to base a diagnosis. Multiple neuritis presents organic changes, as shown by reflexes, wasting, and the reaction of degeneration.

DISSEMINATED SCLEROSIS.—Buzzard says: "Multiple sclerosis, like hysteria, is common in women at puberty; a history of some moral shock often precedes both; there are few cases of multiple sclerosis in which there are not hysterical symptoms added; and many symptoms of the former have long been looked upon as hysterical." The same writer states that the plantar reflexes are usually well marked in multiple sclerosis, and feeble or absent in hysteria. Paralysis is usually sudden in its onset, and more complete and flaccid in the latter than in the former. When blindness occurs in one eye, it is generally complete at first and comes on suddenly in hysteria, whereas in multiple sclerosis absolute blindness in one eye is rare. In the latter the acuity of vision lessens gradually with contraction of the visual fields, until the eye is almost useless; then vision improves in this eye and fails in its fellow. Atrophy of the optic nerve and nystagmus occur in multiple sclerosis, but are probably never of hysterical origin. The tremor of multiple sclerosis may be simulated by an irregular tremor occurring on voluntary movement in hysteria, but in the latter the excursions are usually less; there are a tardiness of the initial muscular effort and a contraction of the antagonistic muscles. Gowers lays considerable stress upon the diagnostic importance of the presence of the last symptom. The hysterical patient affected with tremor will often touch a small object with the index finger without much difficulty, but after the finger has remained a few seconds in contact with the object the arm becomes affected with an irregular or jerky

tremor, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with an object, but as soon as this has been accomplished the tremor ceases.

Cases of CEREBRAL SYPHILIS frequently present hysterical symptoms. If the symptoms are typical of the latter, and there is no positive evidence of organic intracranial lesion, the true nature of the malady can only be suspected from the history of infection or from the evidences of syphilis in other portions of the body.

Feigning.—In most cases of hysteria that I have met there has been an exaggeration of some symptoms, and in not a few some have been intentionally or unintentionally feigned. It is a comparatively easy matter to distinguish between a case of simple feigning and hysteria. Given a case of traumatic hysteria with the stigmata of the disease well marked, it is not always an easy matter to say just to what extent intentional feigning enters into the symptoms.

INSANITY.—It is a mistake to class symptoms of monomania, such as claustrophobia, mysophobia, etc., among those of hysteria.

NEURASTHENIA.—Theoretically, the difference between hysteria and neurasthenia is well marked. The former is a disease with its stigmata and paroxysmal symptoms, all or any of which may come on or end suddenly; the latter is an exhausted state of the nervous system, having a gradual beginning and ending, and unattended by stigmata or paroxysmal symptoms. Practically, however, hysteria is a psychoneurosis, and neurasthenia, while it begins as a neurosis, frequently becomes a neuropsychosis. Nerve-exhaustion in a person who is predisposed to hysteria may cause the devel-

opment of the typical symptoms of the latter disease. In cases in which hysteria and neurasthenia are associated a careful study of the manner in which individual symptoms have developed will usually enable one to determine which is the primary malady.

EPILEPTIC CONVULSION.—There will, as a rule, be little difficulty in distinguishing between an epileptic and an hysterical convulsion, especially if the physician is fortunate enough to witness the seizure. If this is impossible the presence of an educated nurse, especially trained for this purpose, is absolutely necessary for information on which to base a diagnosis. Points in the diagnosis will be found in this article in connection with the description of the hysterical convulsion. Almost the reverse of these conditions obtain in an epileptic fit.

Feigning.—It is not infrequently necessary to differentiate between an hysterical and a feigned convulsion. This is not difficult unless the malingerer is familiar with the stigmata and paroxysmal symptoms of hysteria. The latter, like dementia, is a most difficult condition for the ignorant to feign. If the malingerer should be a physician or a clever trained nurse the differential diagnosis might be most difficult, and sometimes, perhaps, impossible.

Etiology.—Can a person who is not the subject of a vitiated inheritance develop hysteria on being subjected, for a prolonged period, to some of the well-known causes of hysteria? Or, to put it differently, is the only predisposing cause to hysteria heredity? Such a conclusion has been reached by some alienists in regard to the predisposition to insanity. So few are born with a nervous system free from hereditary taint of some kind that it is very difficult to

answer the query here propounded. Personally, I can see no reason why such exciting causes of hysteria as trauma, toxæmia, shock, and certain chronic diseases may not so exhaust and disarrange the nervous apparatus that it will become almost, if not quite, as weak and unstable as that which may be inherited from an unhealthy ancestry. Probably the predisposition to hysteria when acquired is less typical than when inherited.

HEREDITY.—Herman B. Sheffield is almost alone in attributing slight influence to heredity in the causation of hysteria. It does seem, especially to those who have given the subject of heredity much careful study and who have observed the offspring of unhealthy ancestry, that it is impossible to belittle the direct and indirect influences of heredity as a predisposing cause of hysteria. It is probable that the children of hysterical parents would not themselves become hysterical could they be excluded from all the trying ordeals of life. Such children, however, have weakened, irritable, and unstable nervous organizations, and even the little home annoyances, from which no one is free, are often sufficient to give rise to an attack of hysteria. Briquet found in a study of 351 hysterical subjects that a neurotic element existed in about 25 per cent. of the relatives, and in healthy, non-hysterical women it was traced in only $2\frac{1}{8}$ per cent. As a rule, the earlier in life that hysteria develops, the greater the neurotic element in the relatives. Any influence in the ancestry that vitiates the nervous organization may lead to a degenerative taint in the children. Insanity, epilepsy, alcoholism, syphilis, injuries to the head, etc., in the parents, may indirectly predispose the children to hysteria. Fully-developed hysteria, of

course, is never inherited, but a predisposition to it, a soil favorable for its development, well marked or slight, is probably almost universal in children of hysterical parents, and commonly exists in those who are born with weakened nervous organizations. While most women and many men have nervous organizations favorable for the development of hysteria if they are subjected to exciting causes sufficiently strong, yet they retain ample resisting power to cope with all the ordinary trials of life to enable them to prevent manifesting the disease. I have met many strong men who admitted that they felt hysterical, although I could detect no symptoms of the disease.

Attention called to the comparative frequency with which hysterical symptoms are superimposed upon cases of organic disease of the nervous system. In these cases there is often a neuropathic ancestry, which may be considered the predisposing, as the disease itself is the determining, cause of the neurosis. C. H. Hughes (*Jour. Amer. Med. Assoc.*, Sept. 17, '92).

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Direct heredity is frequent in hysteria, and, according to Briquet, half the hysterical mothers give birth to hysterical children. Liability to convulsions is one of the nervous manifestations most frequently transmitted to offspring (Féré). Silvio Ciarrocca (*Gior. Inter. delle Scienze Med.*; *Can. Pract.*, July, '98).

AGE.—Hysteria is most common between the tenth and twentieth years of life. In nearly one-half the cases the disease first manifests itself during the second decade of life. The disease rarely begins after the fortieth year and is infrequent before the seventh. Of the 92 cases reported in America occurring before the fifteenth year, one child was $1\frac{1}{2}$ years old; one 2 years; three 3 years; and four 4 years.

Two epidemics of hysteria observed in Moscow. One occurred in a school for girls (aged 10 to 13), as many as 18 out of 21 being consecutively attacked. The other case was observed in a lace-factory where a number of young girls, aged from 19 to 26, were engaged. Shataloff (*Wratsch*, No. 9, '91).

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Hysterical angina occurs more frequently in women under forty, tends to periodicity, to become nocturnal, and the attacks are induced by violent emotion. H. T. Patrick (*N. Y. Med. Jour.*, Feb. 22, '96).

Hysteria exists in children at all ages. Eight of the eighteen cases observed were below four years of age, and as many of them were boys as girls. It is as frequent in children as in adults. M. Terrien (*Archives de Neurol.*, p. 299, Oct., '97).

During childhood the discrepancy between the sexes in regard to the relative frequency of the disease is less marked than later in life. Of the 92 cases occurring in children, analyzed by Sheffield, 61 were found in the female and 31 in the male, a proportion of two to one in favor of the female. In adults the disease is ten or fifteen times more frequent in the female than in the male.

Twenty-two cases of male hysteria seen in the course of four years in a ward of thirty-eight beds. Most of these patients were robust, vigorous men, quite able to follow their occupations. Bitot (*Jour. de Méd. et de Chir. Prat.*, Jan. 10, '91).

In the male hysteria usually presents itself in one of the milder forms, and such manifestations as the contractions, the vomiting, and the hysterio-epilepsy rarely occur. N. P. Dandridge (*Boston Med. and Surg. Jour.*, Sept. 19, '95).

RACE.—Hysteria is found among all races; even the savage does not escape altogether, but to a much greater extent than the civilized. The negro in America is frequently the subject of the dis-

ease. The Jews, especially the Russian Jews, in proportion to their limited population, give the largest number of cases. Among the Latin races of our population is found more hysteria relatively than is met with in the native-born. The disease is apparently more frequent in the mild and warmer climates than in the cold.

ALTITUDE.—Persons who are exceedingly nervous, impressionable, and predisposed to hysteria are probably more likely to develop the disease on coming to a high altitude than at sea-level. Like chorea, hysteria is probably most frequent during spring and fall. The conditions inseparable from civilization, especially worry, overwork, and excitement favor the development of hysteria. We meet with cases of habit- or imitation-hysteria just as we see cases of "habit-chorea." Defective education and vicious home-influences, especially as seen with hysterical mothers and oversympathetic friends, are potent causes of hysteria among weakly children and emotional young women.

TRAUMA.—The influence of traumatism in the causation of hysteria has received a great deal of attention from the neurologists during the past fifteen years, and, I think, deservedly so. The cases have formed a group by themselves, and have received the names: "traumatic neurosis," "traumatic psychoneurosis," and "traumatic neurasthenia." They are apparently cases of pure hysteria, and the name "traumatic hysteria," proposed by James Hendrie Lloyd, is probably the best we have. Cases of hysteria from traumatism are frequently the subjects of litigation. It may occur in its most persistent form from apparently slight injuries, and is often found in persons who have no claims for damages. Hysteria from traumatism often persists for

years, and sometimes for life. The paroxysmal symptoms are frequently well marked, and those that may persist for an indefinite time are spinal hyperæsthesia, hemianæsthesia, local paralysis, tremor, contraction of the visual fields, headache, nervousness, and exhaustion. These cases may be distinguished from feigned disease by the presence of the stigmata of hysteria. Traumatic hysteria is by no means limited to the female sex.

Various neuroses may originate from accidents of all kinds, and frequently in consequence of very slight traumatism in which the psychical element is the main factor. In most cases the phenomena can readily be placed under the head of hysteria. Very frequently hysteria is mixed with neurasthenic symptoms, or the latter alone present. Dubois (*Corres. f. Schweizer Aerzte*, Sept. 15, '91).

TOXÆMIA.—Alcohol, morphine, cocaine, lead, arsenic, sulphide of carbon, and autoinfection may give rise to hysteria. Most of these poisons may cause organic changes in nervous structure, and the cases may present symptoms of hysteria and of organic disease at the same time. They may, however, result in hysteria when no recognizable organic changes have taken place.

The motor and sensory paralysis of hysteria may be dependent upon structural alterations in the nerve-centres. Th. Leber (*Deutsche med. Woch.*, Aug. 18, '92).

Of 60 cases of hysteria in men, alcohol was the exciting cause in 18. Alcoholic hysteria is similar in all points to hysteria from other causes.

Hysterical attacks are especially likely to be brought on by a fresh drinking-bout in the subjects of chronic alcoholism, in whom also traumatic hysteria is especially liable to occur. Similar manifestations of hysteria are also met with after chloroform narcosis and in subjects of the morphine habit. Lührmann (*Archiv. de Neurol.*, Nov., '95).

Depressing or irritating mental and moral influences are potent factors in the causation of hysteria. To religious excitement may be attributed a number of cases of the disease. Whatever lessens vigor, exhausts, or depresses, may give rise to hysteria in the predisposed. Among causes thus acting may be placed diabetes, syphilis, typhoid fever, influenza, chlorosis and anæmia, etc. Sexual excesses, masturbation, and ungratified sexual desire are depressing in character and tend, in persons hysterically predisposed, to act as exciting causes of the disease.

Hysteria occasioned by malaria modifies the symptoms of the latter and constitutes a form of malarial attack of pernicious appearance which is important to recognize. Bidon (*La Méd. Mod.*, Mar. 2, '95).

DISEASE OF THE GENERATIVE ORGANS.—There is no doubt that many of the lighter and irritating affections of these organs, both in the male and female, increase the nervous condition of the sufferers, and, if they are not the direct exciting causes of attacks of hysteria, they increase the liability to them and exaggerate the symptoms when the disease is present. It seems true, also, that the depressing effects of prolonged attacks of hysteria increase the tendency to the development of disease of the generative organs. Operative interference on the generative organs, especially in the hysterical female, should only be undertaken when the local condition justifies it. Ovaries should not be removed in the hope that the psychical effects of the operation will cure the hysteria.

There are grave causes of hysteria which arise from irritation of the ovary. In such difficult forms of ovarian histology, where every plan of treatment is of no avail and threaten the existence of the patient, oöphorectomy is indicated.

Spannocchi (*Deutsche med.-Zeit.*, Feb. 27, '90).

In both hysteria and hystero-epilepsy it is necessary to distinguish carefully those cases in which the symptoms are clearly referable to the reproductive organs. These, and these alone, should be operated upon, nor should oöphorectomy be performed on these cases until every other means of relief has been exhausted.

Before operation physical examination may or may not disclose abnormal conditions of the pelvic organs. The operation rests upon rational rather than physical signs.

Operation usually discloses ovaries in a more or less sclerotic condition, and often with cystic degeneration. Adhesions are found in some cases, but not in all. The uterus is sometimes smaller than normal, and sometimes, but not always, its position is not normal. Dudley P. Allen (*Western Reserve Med. Jour.*, Dec., '95).

ORGANIC DISEASE IN GENERAL AND OF THE NERVOUS SYSTEM ESPECIALLY.

—As is well known, there may be an association of organic and functional disease at the same time, or a person who is predisposed to hysteria may develop organic disease, and this, in turn, may cause the manifestation of hysterical symptoms. We have then, as S. Weir Mitchell has so graphically expressed it, "the symptoms of real disease painted on an hysterical background." The fact that the seat of the organic lesion often determines the location and the character of the hysterical symptoms not infrequently misleads the physician, and may cause him to err in diagnosis if he is not on his guard. We often meet with tuberculosis and hysteria in the same subject. A catarrhal condition of the larynx may cause hysterical aphonia, dyspnœa, or even spasm of the larynx. An inflamed joint in a person predisposed to hysteria may lead to the development of hysterical symptoms, such as contracture and paralysis of the limb. It

is not uncommon for a case of tumor of the brain to present many of the most pronounced symptoms of hysteria. I have at present a patient under my care who has been treated for a period of eighteen months for hysteria and alleged uterine and gastro-intestinal disorders. She has been subjected to several operations by certain official surgeons. Besides her hysterical symptoms, she has double-choked disk, blindness, intense headache, vomiting, cerebellar titubation, and paralysis of one side of the face. A careful examination, and the recognition of the symptoms of organic disease would have prevented the error in diagnosis and saved the patient unnecessary annoyance and pain, and her friends needless expense.

I have seen a few cases of tubercular meningitis in the adult in which the early symptoms were of an hysterical character.

SUGGESTION, while probably not a direct exciting cause of hysteria, yet is capable, when the disease is present, of exaggerating the symptoms, and possibly may, in persons who are very nervous and hysterically inclined, be the influence sufficient for its development. Repeated medical examinations, while the physician makes from time to time diligent inquiries for certain associated symptoms, soon lead hysterical subjects to assume the lacking phenomena in their own cases; so that what was at first a slight hysterical disturbance becomes in time fully-developed hysteria. I have observed the effect of suggestion on hospital patients who were not at the time the subjects of examination, but intently watching the investigation of other patients in the same ward.

Pathology.—So far as we know, hysteria has no anatomical basis. In the absence of any demonstrable change in

the central nervous system its pathology must remain theoretical and speculative. As the clinical phenomena of this disease are observed there seems to be a faulty interpretation or misinterpretation of afferent impressions, a morbidly-emotional state, with disturbed will and reason; hence all the efferent impulses, both conscious and subconscious, are perverted or allowed to run at a tangent. The morbid process is probably a disturbed condition of the cerebral cortex, affecting the neurons, their processes, and the protoplasmic material, giving rise to perverted function of the highest nerve-centres and leading secondarily to derangement of the normal or harmonious action of the lower centres and of the sympathetic nervous system.

Prognosis.—The disease is rarely dangerous to the life of the patient, yet it must be borne in mind that a person may become so exhausted that death takes place in spite of the efforts made to improve nutrition. Gowers mentions one case of death from spasm of the larynx. The prognosis of severe hysteria in childhood is not as good as some writers seem inclined to believe. Children so afflicted not infrequently become chronic hysterical subjects as they grow to years of maturity. The mental development is often deficient in such children. The lighter forms of hysteria, both in children and adults, usually recover comparatively rapidly if judicious treatment is instituted. The inherited nervous or hysterical temperaments, and sometimes the acquired predisposition, also continue through life. The natural tendency of all cases of hysteria is to chronicity. In nearly all the milder cases, and in the vast majority of the severer ones, the symptoms, including the stigmata and the paroxysms, disappear entirely under favorable circum-

stances, but relapses are common if the patients are subsequently subjected to trying ordeals. Cases which show evidences of beginning mental degeneration are practically hopeless. Traumatic hysteria may last for years, or even a lifetime. Spontaneous cure rarely occurs in the male, although hysteria in the male subject is usually curable. It seems to be the experiences of most physicians that hysteria in the female, associated with chronic pelvic troubles, is very obstinate, and often rebellious to treatment. Paralysis, contracture, or anæsthesia may persist for a long time and finally disappear rapidly or even suddenly.

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A fatal termination may sometimes result from the different effects of hysteria, and death may be due to spasm of the glottis so severe as to require tracheotomy. Sudden death may occur after hysterical vomiting,—in one such case no lesion of any kind being found on post-mortem examination. Fournier and Sollier (*Jour. de Méd.*, Aug. 25, '96).

Treatment.—**PREVENTION** is of great importance. If more attention were paid to it during childhood and early youth there would be fewer cases of hysteria, both in children and adults. Vitiating states of the nervous system in parents and their ancestors may give to the offspring weak, irritable, and unstable nervous organization. The associations and environments of such children, frequently consisting of hysterical manifestations in the parents or other relatives, undue parental anxiety and sympathy, lack of self-control, vicious habits and methods of education, may suggest trains of thoughts and actions to the children that will sooner or later lead to the development of hysteria in them. When practicable, oversympathetic and over-

anxious parents should delegate the early education and care of their children to suitable nurses or attendants. Separation of the children from such parents and other relatives is followed by good results if tutors and companions are selected with judgment, so that the training is in the right direction. While the mental training, which is the more important, should be carefully looked after and continued for years, the physical should not be neglected. Open-air life and exercise should be insisted upon as much as possible; cool or cold baths ought to be given night and morning, followed by brisk rubbing of the skin by means of a coarse towel; the diet should be nutritious and easy of digestion, and most of the sweetmeats excluded; regular and systematic habits as to eating, sleeping, exercise, and study should be rigorously maintained; and any disorder of the health should be corrected as soon as possible.

DEVELOPED HYSTERIA.—As isolation is of the utmost importance in the treatment of hysteria, considerable judgment and skill are necessary in selecting those who are to form the companions of hysterical subjects. The nurse should be faithful, educated, and well trained, and have good sense, tact, patience, gentleness, firmness, and diligence in her work. The patient is often compelled to be alone with her nurse for months, and if the latter is tactless and irritating the best-directed efforts of the most skillful physician will be defeated. The physician should be firm, but gentle, and the possessor of considerable personal magnetism. Unless the physician can inspire the confidence and respect of his patient he should not undertake the treatment of a severe case of hysteria.

The rest-cure of Weir Mitchell has many advantages in the treatment of

hysteria. It gives an opportunity to separate the patient from parents and sympathetic relatives and friends; it enables the physician to carry out to the letter, without interference, special plans of treatment; and it affords an opportunity to inspire the patient with hope by the proper suggestions, without the latter's being constantly counteracted by "Job's comforters." The rest-cure is not necessary for all cases of hysteria, but there are few that will not improve much more rapidly by isolation from relatives and friends than they will at home.

Forced feeding, massage, and faradization are important aids in the treatment. Milk is one of the best articles of diet. It should be deprived of most of its cream at first. This may constitute the only article of diet in the rest-cure cases for two or more weeks. Food should be given the patient every two hours while she is awake. Massage and electricity may be employed daily or on alternate days.

In hysteria the rain-shower and the jet are usually efficacious. Dana (*Dietetic Gaz.*, Dec., '91).

Strong galvanic currents (20 to 60 milliamperes; electrodes, 6 by 12 centimetres) to the back and ovarian region used with almost uniformly good results in hysteria. Hirschfelder (*Med. Standard*, Aug., '91).

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Neurasthenic patients who are also hysterical often derive great benefit by static electricity or by franklinization.

Most, but not all, hysterical patients whose condition is proved by static electricity show an intolerance, varying in degree, toward the high-frequency currents, and especially toward autoconduction in the electric cage. Faradization, which is, as a rule, indicated as alone serving to produce an effect upon certain local hysterical troubles, especially those of sensibility in one organ or a limited

region, is often powerless, while static electricity, which acts in a general manner, may give more rapid and more effectual results. Apostoli and Planet (*Annales d'Electro.*, May 15, '98).

The moral treatment is of great importance and requires tact and skill on the part of the physician and nurse. In some cases hypnotism may be resorted to so that suggestions may be more effective; but, as a rule, this should be avoided, and is, in the vast majority of cases, unnecessary. Repeated assurances on the part of the physicians may inspire the hopes of the patient; especially is this true if the nurse has the tact and good judgment to increase the patient's confidence in her physician.

As a rule, it is best to get along with as little medicine as possible. It is a mistake absolutely to prescribe the bromides in hysteria, as some have done. Sodium bromide in 10-grain doses after each meal, diluted with half-glass of water, is often effective in relieving restlessness and sleeplessness. It should be employed only for such special purposes. Its indiscriminate use in these cases cannot be too strongly condemned. Such tonics as reduced or lactated iron, arsenic, valerianate of zinc, extract of sumbul, etc., may be given as occasion requires. I have never employed oil of turpentine, recommended by Gowers to be pushed to the point of strangury.

The special symptoms often require relief. Aphonia is sometimes relievable by the faradic current applied to the throat externally. Weir Mitchell has tried it with success in some cases, teaching the patient to endeavor to speak only after fully inflating the lungs. Paralysis sometimes disappears suddenly. Usually after applying massage or electricity the patient may be induced to move a group of muscles, and if this is commented on favorably the voluntary movements may

be increased after each treatment. Contracture is best treated by gentle measures, such as rubbing the parts and gradually extending the limbs a little from time to time. Sometimes it is necessary to etherize the patient and forcibly extend the limbs, or even perform tenotomy. Anorexia and vomiting are best overcome by absolute rest in bed, judicious feeding, and firmness in the management of the patient. If the food continues to be ejected the nasal tube may be employed with good effect. The sensory disturbances may be treated with the faradic brush, small and repeated blisters, and suggestion. Retention of urine should not be relieved by the catheter until all other means have been exhausted. One of the most effective methods that I have employed is the application of ice to the abdomen or a cold douche to the spine. Suggestion sometimes is sufficient to enable the patient to empty her bladder.

An hysterical convulsion may often be arrested by the sudden and unexpected application of ice to the spine or abdomen, or by placing the patient in a tub and pouring a bucket of cold water over the head and body. A prompt emetic will usually arrest a fit. The best for this purpose is $\frac{1}{10}$ grain of apomorphine given hypodermically. Inhalation of nitrite of amyl will often cause the convulsion to cease. H. A. Hare has recommended holding the patient's nostrils closed for 30 or 40 seconds. Pressure over the sensitive ovary does not always succeed. I have been able on two occasions to cause a sudden cessation of the convulsion by grasping the patient's great toes with each of my hands and firmly extending and flexing them.

In the treatment of hysterical convulsions all attendants who are not needed should be banished from the room. The

first thing to be done is to put pressure upon any hysterogenic zone. Suggestion may be effective, but it often fails. A constant current, rapidly reversed, is also beneficial. In some cases the wearing of

colored glasses, varying the color with the subject, has a distinct effect. Pitres (Pittsburgh Med. Review, May, '91).

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I

ICHTHYOL.—Ichthyol (ammonium ichthyol-sulphonate) is a distillation product prepared from a bituminous mineral, found in the Tyrol, which is rich in fossilized remains of fish and sea-animals, whence the name "ichthyol" (*ἰχθύς*, fish). By dry distillation of this bituminous mineral a crude volatile oil is obtained which, at a temperature of 212° F., is treated with an excess of concentrated sulphuric acid, forming ichthyol-sulphonic acid. This latter substance unites with the alkaline bases (ammonia, soda, lithia, etc.) and forms ichthyol-salts, of which the principal ones are ammonium ichthyol-sulphonate (or ichthyol-ammonium) and sodium ichthyol-sulphonate (or ichthyol-sodium), the former being always understood when the term ichthyol is used alone. These substances are rich in sulphur (about 15 per cent.), which is combined partly with oxygen, partly with carbon, in a condition similar to that in mercaptans and organic sulphides (Baumann). Ichthyol has a reddish-brown color and a bituminous taste and odor. The sodium salt is semisolid (the consistency of a solid extract), and the ammonium-salt is a thick, brown liquid of the consistency of syrup. Ichthyol is readily soluble in water and in a mixture of equal parts of alcohol and ether; it mixes well with lanolin, vaselin, glycerin, fats, and oils, and with collodion and traumaticin.

Preparation and Dose.—Ammonium ichthyol-sulphonate, 3 to 20 minims.

Lithium ichthyol-sulphonate, 3 to 10 grains.

Sodium ichthyol-sulphonate, 3 to 10 grains.

Zinc ichthyol-sulphonate.

Hydrargyrum ichthyol-sulphonate.

Physiological Action.—Ichthyol has antiphlogistic, anodyne, alterative, antipruritic, antiseptic, and astringent properties. Its peculiar virtues are largely ascribed to the large amount of sulphur it contains.

When administered internally, although having a peculiar odor, it excites no nausea. In medicinal doses it is believed that it retards the disintegration of albuminoid substances and favors their formation and assimilation (Zuelzer, Charles). In larger doses it increases peristalsis and has a laxative action on the bowels. Helmers has found that a third of the sulphur contained in the drug is eliminated by the urine, while the remaining elements pass out in the feces. He also finds that the sulphur of the ichthyol takes at least seven days to be completely removed from the organism; hence he concludes that ichthyol is not simply passed through with the food-excretions, but is first absorbed into the system and then again secreted.

When applied locally, it acts as a reducing agent (abstracts oxygen from the tissues) and exerts a peculiar contractile effect upon the vascular tissues; hence the application of ichthyol is followed by a diminution of heat, a reduction of

swelling, a paling of the tissues, and a relief of pain (Unna). Moreover, the drug undoubtedly inhibits bacterial development, as proved by the experiments of Fessler and Klein.

Injected subcutaneously, ichthyol lowers the rectal temperature for about an hour (Dujardin-Beaumetz).

Therapeutics.—Ichthyol is not only peculiar in its origin, but in that it possesses so many widely-different therapeutic properties. We would naturally infer that its use would be indicated in a large variety of ailments and disorders. This we find to be true. Although not a panacea, it has established itself as one of the most valuable therapeutic aids at our command.

Ichthyol can be used pure or dissolved in any of the usual solvents.

It can be administered internally in substance, in pill, capsule, or watery solution (adding some essential oil to cover the taste).

It can be used externally, or topically, in spray, by inhalation or gargle, in ointment, in suppository or on tampons, in water or oily solutions, or as a varnish (dissolved in collodion or in traumatizin).

Ichthyol, when given by the mouth, may be increased to 15 grains a day. Locally, it may be mixed with lanolin, zinc ointment, or glycerin, varying in strength from 5 to 50 per cent. For a regenerative action, the weak ointments are better; for a resolvent action, as in gout, rheumatism, and neuralgias, the strong ones are recommended. T. Crans-toun Charles (Lancet, Sept. 26, '91).

To produce an impermeable layer of ichthyol, which can be easily and quickly removed without irritating the skin, the writer uses the following: Ichthyol, 40 parts (by weight); starch, 40 parts; concentrated solution of albumin, 1 to 1½ parts; water, enough to make 100 parts. The constituents must be mixed in definite order: the starch must be

moistened with the water, the ichthyol then rubbed well in, and, finally, the albumin must be added. The concentration may be regulated by the thickness of the layer, the first application being wiped off with a moist cloth, so as to have the finest possible coating. An ichthyol-carbolic-acid varnish having the same properties can be made in a similar way, with the omission of the albumin. The formula is: Ichthyol, 25 parts; carbolic acid, 2.5 parts; starch, 50 parts; water, 22.5 parts. The ichthyol and carbolic acid are dissolved in the water with gentle heat, and the starch then added. The first preparation, "vernice sum ichthyoli," is recommended in acne when the skin is irritable, in rosacea seborrhœica and in rosacea simplex, in "ulerythema centrifugum," in intertrigo, "tubercular" eczema, seborrhœica eczema, and erysipelas. Unna (Brit. Jour. of Derm., Apr., '91).

When applied externally, previous washing (except when contra-indicated, as in eczema) of the afflicted parts each time, with soap and warm water, and gentle drying are advised. After the painting, inunction, or embrocation, it is best to cover the parts with carded cotton or flannel, and apply over all rubber cloth or rubber tissue, to prevent evaporation, repeating the process night and morning. To avoid staining the clothes, ichthyol may be applied pure and then dusted with French chalk to form a crust, the usual dressings being afterward applied. The odor of ichthyol may be disguised, if desired, by the addition of a small quantity of vanillin or cumarin or of the oils of citronella, eucalyptus, or turpentine.

The remedy can be administered by subcutaneous injection in weak, watery solutions (1 to 3 per cent.), but if not freshly prepared the solution must be previously sterilized by boiling for a short time before using. For the hypodermic injection of exudates and tumors,

solutions as strong as 50 per cent. have been employed.

The stains upon the clothing and bed-linen, soiled during the application of ichthyol, may be removed by boiling in soap and water, or by washing with soft soap, if attended to at once.

RHEUMATISM.—Ichthyol is useful in all forms of rheumatism. Its application in these cases is followed by a prompt relief or cessation of the pain, and a diminution of the swelling, redness, and febrile action. Dressings kept constantly moist with a watery solution (10 to 20 per cent.) of ichthyol have proved of great value in acute arthritis, muscular rheumatism, lumbago, sciatica, and gout.

If an ointment be preferred the following may be used:—

R Ichthyol, 2 to 4 drachms.

Oil of citronella, 15 to 30 drops.

Lard, vaselin, or lanolin, 1 ounce.

—M.

In acute cases this may be gently rubbed over the affected parts and a piece of linen (lintine) spread with the above applied. This is to be covered with cotton and bandaged firmly. In subacute or chronic cases the ointment is best rubbed in well before applying the cotton and bandage. Ichthyol in olive-oil (1 to 3) may be used in the same way. The effect of these applications, especially in subacute and chronic cases, may be heightened by giving ichthyol-sodium (2 to 6 grains) internally, two hours after meals, either alone or combined with an equal quantity of sodium salicylate.

Forty-eight cases treated with sulph-ichthyol of soda in doses increasing up to 20 grains a day. It has a peculiarly favorable influence on the general condition. Its action was especially good in rheumatism. Lorenz (Berl. klin. Woch., July 16, '88).

After several days the stomach can tolerate $\frac{1}{2}$ to $1\frac{1}{4}$ drachms of ichthyol. Therapeutic action is largely due to the 15 per cent. of sulphur which it contains. F. Vigier (La Semaine Méd., Feb. 18, '91).

Ichthyol recommended hypodermically, as it possesses, under these circumstances, analgesic properties. Particularly is it of value in cases of neuralgic pains associated with inflammatory processes which have caused exudations. Damines (Thèse de la Faculté de Paris, '92).

PERITONITIS.—In peritonitis ichthyol is best applied pure, with a brush, over the whole abdomen. The abdomen is covered by cotton, and that again by rubber tissue or thin rubber cloth to prevent evaporation. Pain, tenderness, tympanites, and fever subside under this treatment.

PHTHISIS.—Scarpa treated a series of 150 cases of tuberculosis with ichthyol, giving 20 to 200 drops daily of a watery solution of the pure drug (1 to 2) with the following results: 23 deaths; 17 apparently cured; 50 notably improved; 32 some improvement; 28 not improved. The beneficial action of the remedy was manifested first in the relief of the cough, expectoration, and dyspnoea, and later by an improvement in the general condition.

Ichthyol recommended in pulmonary tuberculosis. It is cheaper than creasote, and in many cases is better borne. The writer has used it during the past two years in more than 100 cases with good results; particular attention called to the remarkable effect it has on nutrition. He prescribes a mixture of equal parts by weight of ichthyol and water, and directs 4 drops to be taken t. d., before meals if it can be borne; if not, after meals. A little black coffee helps to cover the taste. The dose must be gradually increased by a drop daily, until 40 drops are taken at once; it should always be taken well diluted with water. The full dose must be continued for a long time. Cohn (Lancet, i, 1521, '94).

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In the treatment of pulmonary tuberculosis, dry catarrh, purulent catarrh, bronchial dilatation with fœtid expectoration, acute bronchitis, best effects obtained from employment of ichthyol. In numerous cases of tuberculosis the use of guaiacol or creasote was alternated with that of ichthyol for several months with excellent results. It was employed in capsules containing 4 grains each and covered with a coating which enabled the capsule to pass through the stomach into the intestine without becoming dissolved. From 4 to 8 capsules a day were taken at meal-times. In two-thirds of the cases there was an increase in weight. M. le Tanneur (*Gaz. des Hôpitaux*; *Revue Méd.*, Jan. 5, '98).

GYNÆCOLOGICAL DISORDERS.—In these disorders ichthyol has been used on account of its anodyne properties, its resolvent and absorptive action, and its kolyseptic powers. It has been found useful in removing periuterine and pelvic exudates, in the treatment of chronic metritis, inflammatory condition of the tubes and ovaries, erosion of the cervix uteri, leucorrhœa, and pruritus of the genitals. The remedy is used internally in pills ($1\frac{1}{2}$ grains), at first 3 daily, later 6. Locally, a mixture of ichthyol, 1 drachm, and glycerin, $2\frac{1}{2}$ ounces, may be applied on cotton tampons. The remedy may also be rubbed in over the abdomen in ointment with lanolin (equal parts), or combined with soft soap (1 to 8). Suppositories containing 1 to 4 grains of ichthyol may be administered *per vaginam*. Ulcerations and erosions may be painted with pure ichthyol. For leucorrhœa lavage with a watery solution (5 to 10 per cent.) or a 5-grain suppository may be used night and morning, preceded by a copious hot-water irrigation.

Ichthyol found of considerable value as an analgesic and resolvent in parametritis, perimetritis, affections of the ovaries

and tubes, cervical erosions, and pruritus vulvæ. It is used locally in the form of a 10-per-cent. glycerin solution of the sulphichthyolate of ammonium, applied on tampons and internally as a pill. The disagreeable odor of this drug can be masked by the addition of cumarin. Freund (*Lancet*, May 24, '90).

Ichthyol is superior to the nitrate of silver, creolin, and carbolic acid in the treatment of various inflammatory disorders of the female genitalia. The best preparation for injections is a 10-per-cent. solution of the drug in glycerin. Richard Bloch (*Jour. de Méd. de Paris*, May 10, '91).

Ichthyol is recommended as a resolvent in chronic affections of the ovaries, tubes, cellular tissue of pelvis, and even in hæmatocele. A glycerole of ichthyol mixed with boric acid, 10 to 100, is employed. A tampon saturated with the mixture is placed in the vagina, and may be kept there for three days. Ed. Egasse (*Bull. Gén. de Thér.*, July 30, '91).

One hundred and fifty cases of women suffering from various affections, 142 being of the genital organs, treated by ichthyol. Tampons saturated with glycerole of ichthyol (10 per cent.) were used, and the drug was administered internally at the same time in pills of $1\frac{1}{2}$ grains, from 1 to 6 daily being taken. The disagreeable odor may be disguised by a 1- or 2-per-cent. essence of citronella or essence of eucalyptus. Of 22 cases of inflammation of the uterus there were 12 cures, 9 were improved, 2 failures; of 120 cases of periuterine inflammation, 59 recoveries, improvement in 56, 5 failures: 2 cases of fissure of the breast, rapid cure; 6 cases of inoperable cancer, considerable diminution of the fœtid secretion. R. Hermann (*Inaugural Dissertation*, '92).

The pure drug found most satisfactory and reliable in congested states of female pelvic organs. Storer (*Boston Med. and Surg. Jour.*, Aug. 2, '94).

Fifty-per-cent. dilution with glycerin is the best congested states of the female pelvic organs. A. D. Sinclair (*Boston Med. and Surg. Jour.*, Feb. 8, '94).

Ichthyol, owing to its analgesic, antiseptic, antiphlogistic, and resolvent ac-

tion, may render real service in gynæcology if its employment is judiciously associated with other therapeutic measures, according to the indications.

Lorain (*Jour. de Méd. de Paris*, Mar. 28).

GENITO-URINARY DISORDERS.—In acute cystitis the lower part of the abdomen may be painted with ichthyol, pure or in a 30-per-cent. ointment, to relieve the pain. The bladder may then be irrigated five or six times daily with a warm (86° F.), aqueous solution (2 per cent., increasing to 5 per cent.). In chronic cystitis a warm 1-per-cent. solution may be used once daily.

Gonorrhœa is amenable to urethral injections of a watery solution (1 to 3 per cent.) of ichthyol. Neisser states that a 1-per-cent. solution will destroy gonococci.

Ichthyol regarded best-known remedy for genito-urinary affections of blennorrhagic origin. The writer used it in 110 cases, 80 of which were men affected with blennorrhagia in various stages, and 30 were women showing inflammation of all parts of the genital apparatus. The men were given urethral injections of an aqueous solution (1 to 4 per cent.), while tampons, soaked in 10-per-cent. glycerole of ichthyol, were introduced into the vagina of the female patients. The results were brilliant. Only 7 of the men were not cured, though improved, the rest leaving hospital entirely recovered after a treatment of from fifteen to thirty days. The women were cured without exception. P. Colombini (*Commentario Clin. delle Mal. Cut. e Genito-Urin.*, Nos. 5, 7, '93).

Use of ichthyol strongly advised in acute urethritis, a 2-per-cent. aqueous solution being injected from five to six times daily, gradually increasing the strength to 5 per cent. As the patient improves, the number of injections are diminished to one in the morning and one in the evening. In acute cystitis the writer applies 30-per-cent. ichthyol ointment to allay pain, and after the acute period employs irrigation, injecting about one quart of a $\frac{1}{2}$ -per-cent. aque-

ous solution of ichthyol twice a day for a few days and then once a day. In chronic cystitis he injects, once daily, a 1-per-cent. solution of ichthyol. Villetti (Report of Inst. of Exp. Pharm. of the Royal Univ. of Rome, '94).

Ichthyol employed with success in the blennorrhagic urethritis of women. R. Coltman, Jr. (*Univ. Med. Jour.*, Mar., '94).

Ichthyol in hot solutions, for urethral use (0.5 to 2 per cent.), is very valuable in acute urethritis, especially in those cases where the mucous membrane is very sensitive. In subacute urethritis, where the lesions are circumscribed, local applications (with the aid of the endoscope) render great service. Ichthyol suppositories, in the majority of cases, cause the inflammatory symptoms to disappear in the course of a prostatitis. In chronic urethritis, with infiltration, ichthyol by itself is inefficacious, but associated with the mechanical treatment, or alternating with it, it appears to be of great benefit. Administered internally, it does not have any beneficial effect on nephritis or pyelitis. H. Lohnstein (*Therap. Monats.*, Apr., '94).

In cases of primary and secondary catarrh of the bladder the writer washes out the viscus with $\frac{1}{2}$ - to 1-per-cent. solutions of ichthyol. By this means pain was relieved, micro-organisms were destroyed, and ammoniacal fermentation prevented. Colosanti (*Riforma Medica*, Jan. 12, '94).

In prostatitis the injection of a small syringeful of a 10-per-cent. solution by the rectum three or four times daily relieves the pain and causes a marked reduction in the size of the swelled gland.

CUTANEOUS DISORDERS.—Ichthyol is especially useful in skin affections associated with atony and induration of the deeper layers of the skin and in which pain or inflammation exists.

In acne Unna advises the use of a 50-per-cent. watery solution of ichthyol, well rubbed in on retiring, and washed off with warm soap-water in the morning; during the day a weak solution of bi-

chloride of mercury is used. In addition to the external use of the remedy, Unna advises the internal use of it, in doses of from 8 to 30 grains daily.

In rosacea, with tendency toward eczema, mild applications are used externally; in forms tending toward acne the remedy may be applied freely. In nervous eczema ichthyol should be used internally and externally. For erythema multiforme and lichen urticatus Unna advises external applications of pure ichthyol or of strong solutions. In intertrigo a 10-per-cent. salve or watery solution is beneficial; in eczema marginatum, the same is advised, with the addition of from 2 to 10 per cent. of salicylic acid. Ichthyol is also used with advantage in the chronic stages of keloid and lupus. In the latter Unna recommends the following:—

- ℞ Bichloride of mercury, 1 to 4 parts.
Sodium ichthyol-sulphonate, 5 to 10 parts.
Distilled water, enough to make 100 parts.—M.

Ichthyol is of decided benefit in both acute and chronic urticaria, and also in chronic alcoholism, in which the tremor rapidly disappeared, the appetite returned, and sleep became normal and undisturbed. The depression and chronic gastric catarrh were likewise greatly diminished by the drug. Good results were also observed in chronic rheumatism, administered internally and with local applications. In arthritis deformans the pain was greatly lessened. Nils Gadde (*Therap. Monats.*, Mar., '90).

Ichthyol given internally is an effectual remedy for certain forms of urticaria caused by errors of diet. Lanz (*Rev. Méd.*, Oct. 21, '94).

The efficacy of ichthyol is not increased by the addition of lanolin, but is materially augmented by rubbing. H. A. Hare (*Boston Med. and Surg. Jour.*, Oct. 15, '94).

Following paste recommended in eczema of the female genitals:—

- ℞ Ichthyol, 1½ to 2 parts.
Powdered starch,
Flowers of zinc, of each, 12 parts.
Vaselin, 25 parts.

Von Sehlen (*Monats. f. Prakt. Derm.*, July, '94).

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Itching, which is so often found in connection with eczematous conditions of the anal and genital regions, can be greatly relieved by the use of an ichthyol wash ranging in strength from 1 to 2 drachms to the ounce of water. Cantrell (*Phila. Poly.*, Apr. 4, '96).

The variola ichthyol is an ointment composed of 10 parts of ichthyol to 60 of fat and 20 Sanoli's olive-oil, chloroform, or glycerin. The ointment should be rubbed in three times a day as soon as the papules become visible. Cassenko (*Brit. Med. Jour.*, June, '97).

In erysipelas ichthyol has proved of great value. It reduces the congestion, tension, swelling, and pain, and appears to limit the extension of the disease. The thickness of the skin determines, in a measure, the strength of the application to be used. The surface is carefully washed and dried, and a salve (30 to 50 per cent.) made with lanolin or vaselin gently rubbed in. For use on the lower extremities Unna advises the following: Ichthyol and ether, of each, 1 part; collodion, 2 parts. Another formula is ichthyol, 2 parts, with ether and glycerin, of each, 1 part. Instead of the foregoing, a watery solution (1 to 3) may be applied two or three times daily.

In erysipelas, experience with a 30- to 50-per-cent. ichthyol ointment has confirmed the value of the remedy. Spread on rags and used to cover the affected area and extend a little beyond, this ointment cured 4 cases of facial erysipelas in two or three days and 5 other cases in five or six days.

In burns and frost-bites good results obtained with ichthyol. The internal use of ichthyol as a reconstitutive and tonic is of great value in anæmic dyspeptic subjects suffering from eczema. Kopp (Münch. med. Woch., Aug. 27, Sept. 3, '89).

In erysipelas the affected parts to be painted morning and evening with colodion, to which ichthyol has been added in the strength of 10 per cent., the application being made so as to cover the healthy skin for an extent of three centimetres around the affected patch; the application is always made from healthy to diseased skin. In eighty cases in which the author has used this method it has not failed once. When the varnish comes away the skin is left in a healthy condition. Victor Cebrian (El Siglo Med., Dec. 17, '93).

The ichthyol preparations (ammonium and sodium) in weak solution in a short time destroy the pyogenic and erysipelas streptococci. Ichthyol is used with success in the suppuration from these cocci. The staphylococcus aureus and albus, the bacillus pyocyaneus, the bacillus of typhoid, ozæna, and anthrax, and the spirillum of Asiatic cholera show more or less resistance to ichthyol. The diphtheria bacillus in fresh colonies is easily destroyed by weak ichthyol solutions, while mature ones are acted upon with difficulty. Ichthyol has rendered good service in the treatment of typhus and ozæna. It is recommended that it should be preserved only in substance or in a 50-per-cent. solution; weaker solutions may be culture-mediums for micro-organisms, as the staphylococcus aureus. Weak solutions should be sterilized by heat. Rudolf Abel (Centralb. f. Bak. u. Parasitenk., No. 13, '93).

In burns of the first and second degrees strong applications are made and a subsidence of pain and congestion follows. Pure ichthyol painted on, or the use of an ointment composed of equal parts of ichthyol, zinc oxide, and vaselin, produces a happy effect.

In burns of the first degree is used a mixture of 5 parts of zinc oxide, 10 parts

of carbonated magnesium, and from 1 to 2 parts of ichthyol. In burns of the second degree the following composition employed: 5 parts of zinc oxide; 10 of prepared chalk; 10 of starch; 10 of linseed-oil; 10 of lime-water; and from 1 to 3 of ichthyol. This material is applied once daily. When there is a great deal of inflammation in the burn these two preparations can be used at the same time, the burn being first dusted with the powder, and the paste being laid on over this. Leistikow (Semaine Méd., xv, p. 487, '95).

In frost-bite Lange recommends the use of ichthyol in olive-oil (3 to 20) used as a paint; Heuss advises ichthyol in camphorated oil (1 to 4), rubbed in once or twice daily, and covered with cotton.

In chilblains (pernio) the use of an ointment of ichthyol (10 to 30 per cent.) or of equal parts of ichthyol and turpentine is attended with good results. Unna advises the use of a mixture of ichthyol, 5 parts; chloroform, 2 parts; and petrolatum, 3 parts, to make an ointment. If the skin is broken the chloroform is omitted and zinc ointment replaces the petrolatum with advantage.

In furunculosis solutions or ointments (10 to 50 per cent.) are equally efficient, the inflammatory symptoms usually subside, and, if applied sufficiently early, ichthyol will abort the boils. With the external treatment it is well to give calcium sulphide in $\frac{1}{4}$ -grain doses every two or three hours for twelve hours, and then three or four times a day as suggested by C. J. R. McLean.

In prurigo and pruritus the application of ichthyol in a 5- to 10-per-cent. watery solution, after washing with warm water and soap, has given excellent results. Lange advises a mixture of ichthyol, 2 parts, in absolute alcohol and ether, each, 9 parts; to be used as a paint or by inunction.

WOUNDS AND INJURIES.—Incised and

post-operative wounds dressed with pure ichthyol heal by first intention. Cracked nipples heal well under a 20-per-cent. ointment, but it must be wiped off before nursing. Fissure of the anus and other anal lesions do well under the use of pure ichthyol applied by means of a camel's hair pencil morning and evening and after defecation.

Ichthyol considered as the most valuable drug in the treatment of anal fissure. A brush is impregnated with the pure drug, and thus introduced into the anus, and the contraction of the sphincter-muscle forces it into all the folds of the mucous membrane. This treatment is assisted when necessary with castor-oil. Van der Milligen (*Monats. f. Prakt. Derm.*, '95).

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Venomous insect-stings should be treated by the application of pure ichthyol, or a mixture of equal parts of ichthyol and lanolin. If, when the surgeon first calls, swelling already exists, ichthyol is applied, sheet India rubber is laid over this, and an ice-bag placed on the India-rubber tissue. Administration internally in such a case of 10-drop doses of a mixture of equal parts of ichthyol and spirit of ether advised. Ottinger (*N. Amer. Pract.*, Feb., '97).

Sprains and painful injuries about the joints do well under ichthyol; it should be well rubbed in, on the surface of the injured parts, covered with cotton, and a bandage firmly applied.

MISCELLANEOUS DISORDERS. — The painfulness of parotitis subsides rapidly when the parts are anointed with ichthyol-lanolin (1 to 2 per cent.) and covered with cotton. In many cases undiluted ichthyol is indicated. (Lange.)

It is an efficient remedy in almost all affections of the mucous tract.

Ichthyol found especially applicable in catarrh of the mucous membranes. In the rapid growth of children, when

scrofulosis is localized in the nose, with ozæna, ichthyol, locally and internally, acts much more quickly and certainly than codliver-oil. Von Hoffmann and Lange (*Therap. Monats.*, May, '89).

Sulphichthyolate employed in a case of chronic nephritis of eight months' standing. Fifteen grains a day caused abundant diuresis and a reduction of the albuminuria. Blittersdorf (*N. Y. Med. Jour.*, Oct. 19, '89).

Inhalations by means of an atomizer of a cold 2-per-cent. solution of ichthyol repeated twice daily, and not too deeply inspired, have given excellent results in acute laryngitis. No ill effects have followed. Ciegiewicz (*N. Y. Med. Jour.*, vol. lxxvii, p. 826).

Two-per-cent. solution of ichthyol recommended as a gargle in anginas of almost every kind, except the follicular variety. The mouth and throat are to be carefully gargled, and a portion of the solution then swallowed. L. Herz (*Wiener med. Woch.*, No. 2, '93).

Ichthyol ointment, 2 $\frac{1}{2}$ - to 10-per-cent. solution, advocated in the treatment of serofulous blepharitis. Luciani (*Ann. di Ottol.*, xxiv).

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Ten- to 15-per-cent. ointment of ichthyol in lanolin is very efficacious in ciliary blepharitis. Germani (*Gazz. degli Osped.*, June 20, '96).

Ichthyol in pills ($\frac{3}{4}$ to 3 grains in twenty-four hours, rapidly increasing the dose to 10 or 15 grains in the day) is one of the most valuable remedies in whooping-cough. Maestro (*Med. Week.*, iv, '96).

In a case of acute idiopathic œdema of the epiglottis in a man of 41, a spray of ichthyol, $\frac{1}{3}$ per cent. in ice-water every fifteen minutes, with ice externally, gave rapid relief. W. P. Meyjes (*Jour. Laryn., Rhinol., and Otol.*, Mar., '97).

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ICTERUS. See JAUNDICE.

IDIOCY. See INSANITY.

INDICANURIA.

Definition.—Indican, in small quantities, is a usual constituent of the urine; under certain circumstances, however, the amount is so large as to merit the designation of indicanuria.

Symptoms.—Normal urine contains very small quantities of indican; about 0.0045 to 0.0195 gramme are excreted in twenty-four hours; different animals secrete much more, horses about twenty times as much. Urine containing much indican is dark colored, brown to black; in rare cases indigo is deposited as a blue powder.

The presence of indican in excess in the urine is demonstrated by different tests.

1. **HELLER'S TEST.**—By the addition of nitric acid a blue-violet ring is formed on the point of contact of acid and urine.

2. **JAFFE'S TEST.**—Equal volumes of urine and hydrochloric acid are mixed in a test-tube; a few drops of a solution of sodium hypochlorite are added and the mixture is shaken. The blue color of indigo will then appear. Stokvis proposes to add some drops of chloroform, in which the indigo dissolves.

[Richardson (Med. News, '95) proposes to substitute a solution of hydrogen dioxide to the solution of hypochlorite of soda, contending that the reaction takes place more rapidly and that the color is more distinct. F. LEVISON.]

Senator modified Jaffe's test in the following manner: Ten to 15 centimetres of urine are mixed with an equal quantity of concentrated hydrochloric acid; 3 to 5 cubic centimetres of chloroform and 1 drop of saturated solution of chlorinated lime are added and the mixture is shaken. The chloroform is colored blue when indican is present in excess.

Obermayer's Test.—The urine is precipitated by the addition of a solution of

acetate of lead; the filtrate is treated by the addition of concentrated hydrochloric acid and a few drops of a 2 to 4 per 1000 solution of perchloride of iron; the mixture is shaken with chloroform.

Quantitative tests have been indicated by Jaffe and Salkowski, advantage being taken of the bleaching powers of hypochloride of calcium, a standard red solution of this salt being used to effect the complete decoloration of the indigo.

Etiology.—By the decomposition of proteids indol is formed, which is absorbed in the intestine and oxidized in the blood, forming indoxyl. When excreted in the urine it is combined with sulphuric acid and excreted as indoxyl-sulphuric potassium-indican. This salt may be isolated as rhomboid, white crystals, which are soluble in water and hot alcohol, hardly soluble in cold alcohol, and not at all in ether; by heating it with hydrochloric acid it is divided into sulphuric acid and indoxyl, which in presence of oxidizing substances gives indigo. By fermentation of urine containing much indican, indigo is also formed.

In some cases indigo-red also is formed by heating the urine with nitric acid. Rosenbach (Berl. klin. Woch., '89 and '90).

Indicanuria is ordinarily dependent on decomposition of the intestinal contents consequent upon constipation or occlusion of the intestinal tract, especially of the small intestine, while occlusion of the large intestine does not cause it. In the conditions of hunger the albuminous secretions of the bowels are decomposed and form indol; newly-born infants do not produce indol, because their intestines do not contain bacteria.

[Gehlig (Jahrbüch f. Kinderh., '97) found that nurslings in good health only present traces of indican in the urine. When digestive troubles occur the quan-

tity of indican is augmented. F. LEVISON.]

Infants nourished with sterilized cows' milk show, at times, small amounts of indican in the urine, even if the digestion is normal. In case of digestive derangement indican is almost always present, the amount increasing with the intensity of the derangement. In older children with normal digestion the presence of small amounts of indican in the urine is the usual condition, as well as in adults. This excretion is increased after the ingestion of food rich in nitrogenous matters, particularly meat and eggs. No relation between tuberculous disease and increased elimination of indican could be determined. Gehlig (*Jahrbuch f. Kinderh. und physische Erziehung*, Aug. 6, '94).

Indicanuria regarded as of real importance in children. It exists in normal urine, but in such small quantity that indicanuria may be regarded as pathological, especially in children in whose food there is less nitrogen than in that of adults. Indican being a derivative of indol, indicanuria is particularly met with in cases in which there is a hyperproduction of indol, as in acute and chronic affections of the digestive tract and in certain acute diseases, such as typhoid fever, pneumonia, severe chorea, etc. It is constant in tuberculosis, with which it is in direct relation. Djouritch (*Revue Men. des Mal. de l'Enfance*, Feb., '94).

Indican is found in cases of decomposition of pus, as in putrid empyema, putrid suppurations, etc.; it has also been observed in different diseases, especially of the stomach and the bowels, carcinoma of the stomach, gastric ulcer, acute and chronic gastric catarrh, cholera nostras and Asiatica, peritonitis, etc.

[Simon (*Amer. Jour. Med. Sci.*, '95) states that a relation exists between indican and the acidity of the gastric juice in the sense that a subnormal amount of free hydrochloric acid calls forth an increased degree of intestinal putrefaction, and, therefore, an increased formation of indol. F. LEVISON.]

The constant elimination of five milligrammes of indican in adults, or even less in children, is pathological. The excess depends upon the increased putrefaction of albumins or deficient altered activity of the bile and pancreatic secretions. In such case flatulence occurs, and the whole condition may be benefited by change of diet. In other cases there is continuous cause of indican with or without flatulence, uninfluenced by diet. Herter and Smith (*N. Y. Med. Jour.*, June 22 to July 20, incl., '95).

Presence of indol and indican almost constant in the liver affected with various lesions, much less frequently in the kidneys, spleen, lungs, and heart. The greater frequency of their presence in the liver is explained by the fact that this organ, being on the route of the suprahepatic portal circulation, is one of the store-houses of the indol developed in the intestines. F. Villard (*Marseille-méd.*, June 15, '95).

In a series of experiments the quantity of indican in the urine, under a purely albuminous diet, was enormously increased in patients with affections of the spleen and in dogs whose spleens had been removed. This would tend to indicate that the spleen has the function of checking the processes or eliminating the products of albuminous decomposition in the intestine. Mazzetti (*Wiener med. Woch.*, Aug. 1, '91).

Indican found in the urine of typhoid and other forms of fever and in faecal toxæmia. Churton (*Lancet*, Aug. 24, '89).

There is no causal relation between indicanuria and suppuration, and the increase of the latter is of no value in revealing a hidden abscess. Beckmann (*St. Petersburg med. Woch.*, July 28, '94).

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The introduction of large numbers of colon bacilli into the intestines increases the indican and the ethereal sulphates of the urine. The introduction of large numbers of the proteus vulgaris may increase the ethereal sulphates, but not perceptibly. The introduction of the lactic acid bacillus may reduce markedly the

indican and ethereal sulphates. Herter (Brit. Med. Jour., Dec. 25, '97).

Indican has been recognized as a symptom of tuberculosis.

[Fehm found by a comparative examination of 15 tuberculous and 14 non-tuberculous children (Corres. f. Schweizer Aerzte, '93) indicanuria in tuberculous children in a proportion of 61 per cent. and in the non-tuberculous in a proportion of 40 per cent. F. LEVISON.]

In the urine of healthy children and those suffering from simple dyspepsia indican was very rarely found. In grave forms of diarrhœa it was almost invariably found; but when the diarrhœa was mild it appeared less often and in smaller quantities. In tuberculosis it was always present. The author believes it due to the decomposition of milk-albumin. Hochsinger (Wiener med. Woch., Apr. 18, '91).

Indicanuria cannot be considered as of significance in the diagnosis of tuberculosis in children. Giarre (Lo Sperimentale, p. 98, '93).

The indican reaction is more positively connected with anomalies of digestion, especially in mixed feedings, than with tuberculosis, the principal malady; consequently indican has no other diagnostic importance than that of indicating the degree of decomposition of albuminoid substances in the intestines. Between indicanuria and tuberculosis there is no relation of sufficient constancy to give value to Hochsinger's sign that indicanuria is a sign of tuberculosis in childhood. Cima (Trans. Internat. Cong. of Rome, '94).

It must, nevertheless, be borne in mind that ingestion of large quantities of nitrogenous food is apt to lead to indicanuria even if no derangement of the digestion be present.

In different diseases of the nervous system, especially after epileptic fits, an abnormal quantity of indican has been noticed in the urine.

Indican found in the urine of patients suffering from mental diseases; nothing characteristic established except that the

quantity was twice as great in the acute as in the chronic forms. Bondurant (Amer. Medico-Surg. Bull., Feb. 15, '94).

In chronic cystitis indican may be decomposed in the bladder and indigo deposited from the urine as a blue powder.

[Ord (Berl. klin. Woch., '78) found a calculus, consisting chiefly of indigo, in the pelvis of a patient who died from a sarcoma of the kidney. F. LEVISON.]

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INFANTILE MYXŒDEMA (CRETINISM).

Definition.—Cretinism is a chronic disease of nutrition due to loss of, or impairment of, function of the thyroid gland, and appears at any time between birth and puberty; after puberty it is known as myxœdema. It causes retardation of development in the sensory, motor, and trophic nervous systems, leading to a retention of an infantile state, and to an extraordinary disproportion between the different parts of the body—the brain, bones, skin, mucous membranes, and generative organs suffering most.

Literature of '96-'97-'98.

Symptoms of cretinism are to be explained as the result of the myxœdematous process in the undeveloped tissues of an infant. A scientific application of the principles of heredity by such methods as have been used in such subjects as deaf-mutism, idiocy, and other nervous diseases will demonstrate similar relations and yield similar results in cretinism. William B. Noyes (N. Y. Med. Jour., Mar. 14, '96).

Symptoms.—These depend to a greater or less extent on the length of time the disease has lasted, and the age at which the affection has developed, but mainly on the degree of involvement of

the functions of the thyroid gland. Girls are more often affected than boys, though the difference in proportion is not very large, but the symptoms, aside from the sexual organs, are in both sexes the same, and are characteristic in every pronounced case. The disease may vary much in intensity, but even in the less marked cases diagnosis is seldom difficult, when all the symptoms of abnormal development are carefully sought and studied. Cretinism differs from most other diseases in that it is to be recognized by signs rather than by symptoms; the most prominent alterations concern the surface of the body, and are thus readily visible; so that the oversight of a case by a physician familiar with the disease is nearly impossible. When the disease has commenced at birth or very early in infancy, it is seldom recognized before the child is six months old, although it has been diagnosed as early as the sixth week. It may, however, develop *in utero*. After the sixth month the symptoms begin to become prominent; it is noticed that the child does not grow as rapidly as it should, that it is not as bright mentally as is usual, that its tongue is too large for its mouth, and lolls out between the teeth. The tongue may be so large as to impede respiration when the child lies on the back, and pieces of the tongue have even been excised through mistaken diagnosis.

On further examination it is seen that the skin all over the body instead of being soft, and of normal color, is thick, swelled, dry, and scaly. Nowhere, or only to the slightest degree, does it pit on pressure; it lacks the glistening waxy look of œdema due to renal disease. In a very exceptional case reported by Ruhrah, the œdema was not general, but affected certain parts alone of the body.

The desquamation may be furfuraceous, like that of measles, or it may more closely resemble that of scarlet fever. The hair is apt to be thin and coarse, and in older children may be lacking in parts where it is always found under normal conditions, as in the axillæ and on the pubes. Even in infants it will be noticed that the eyebrows and eyelashes are very scant, and perhaps altogether lacking.

Thick hair has been noticed in some cases, but this is certainly exceptional. The face has a false look of old age, and sometimes has a distinct toad-like aspect. The eyelids are puffy and swelled, leaving but a narrow slit through which the eyes can be seen. The nose is depressed between the eyes, and the alæ nasi are thick, thus making it seem still more flat, from the external width of the nostrils. The ears also suffer from the same thickening, and stand out from the head. The lower lip, partly due to the lolling tongue, is everted and swelled. The teeth, if there are any, are irregular, ragged, and decayed; the second teeth often do not appear at all, or are much delayed in coming through, and are then, like the first, diseased, and of abnormal shape and size, although there is nothing distinctively characteristic in their form. The abdomen is swelled, and there is often an umbilical hernia, though this is seldom of large size. The back is arched and there may be more or less curvature of the spine.

The limbs are short and stunted; so that the thick skin lies in folds on the arms and legs and on the face (forehead) as well. The hands and feet are undeveloped, pudgy, and look like those of a pachyderm; fingers and toes are immobile, with a tendency to stand apart, as a result of the morbid condition of the skin. The nails are short, brittle, often

striated, either longitudinally or vertically; they lack the normal glossy appearance. The child is distinctly pale, although there may be some suffusion of the cheeks. The fontanelles remain patent long beyond the normal term. All the muscles of the body are weak; the child cannot support itself, and the overlarge head droops forward, so that the chin may rest on the chest. Goitre, which is common in the endemic form, is only occasionally seen in the sporadic cases, though usually the thyroid gland cannot be palpated. In the supraclavicular regions large masses of fat are sometimes seen, which with the thick, wrinkled skin may form a sort of collar; so that the head seems to be supported, as artificially done in high cervical caries, with a Thomas collar.

The mental condition of the child is as ill developed as the physical; the patient is apathetic, sits about with apparently no interest in any person, not even recognizing his parents or objects about him. If the child attempts to walk, the movements are slow; there is more or less inco-ordination, owing to the general paresis of the muscles; but there is no paralysis; the deep reflexes are present but commonly weak. The face is immobile, there is dullness of expression and action; the child makes no attempts to walk, talk, read or write, and does not answer questions readily.

The child exhibits no desires except, perhaps, for food, and manifests its hunger or thirst by inarticulate cries. There is often a distaste for meat, but the appetite may be voracious. Constipation is usually present. Abnormal sensations are not common, and there is usually retardation in the sense of pain; headache is not complained of. The cretin is usually good tempered and does not cry. The child has to be fed with a

spoon and almost altogether with fluid or semifluid food, for the mucous membranes from the mouth to the rectum are apt to be swelled; these undergo changes similar to those of the skin.

Memory is deficient, and speech is slow, thick, and hoarse. Although idiots, their idiocy is not such as one sees in cerebellar sclerosis: they have no tics, no epileptoid movements; they do not make faces; do not grit their teeth, and do not masturbate. Infants and young children, as in so many other affections, often suffer from convulsions, but these are in no way pathognomonic.

There is no sweating, and no secretion from the sebaceous glands, but there is constant drooling from the wide-open mouth, and there is a secretion of tears. Their temperature is invariably subnormal, and they are always anæmic. They suffer from cold and are subject to sores and ulcers, which do not heal readily. The genital organs are also involved, and show signs of lack of development; the testes and ovaries are small and atrophied. Girls may, however, menstruate, and this profusely, and there is occasionally a tendency to severe hæmorrhage from the uterus, or in both sexes from the nose and gums. The heart, lungs, liver, spleen, and other abdominal organs do not appear to be involved; the kidneys act naturally, though the amount of urine passed, and the percentage of urea and uric acid excreted, may be a little less than normal: a trace of albumin and hyaline casts have been noted in some cases, but these are not persistent and point to no radical organic alterations in the kidneys, but the brain, skin, mucous membranes and bones are invariably affected, usually all of them in about equal degree, though in many cases the body is apparently more diseased than the brain, at any rate as far as can be

judged from a study of the mental faculties.

Literature of '96-'97-'98.

[Combe (Revue Méd. de la Suisse Romande, Anno xvii, Nos. 2 to 6) divides myxœdema in children into three classes, which may be easily recognized by special grouping of the symptoms noted above:—

1. Congenital myxœdema with complete nanism and absolute idiocy.

2. (a) Precocious infantile myxœdema with incomplete nanism and imbecility, the child showing some rays of intelligence. (b) Late infantile myxœdema: merely a backward child, neither idiot nor imbecile, but the intelligence merely less developed than in other children of same age.

3. Abortive ("*fruste*") myxœdema, where there is nanism, swelling of integuments, cyanosis, and coldness of limbs, but mobility is preserved, intelligence is almost normal, and there is very slight cachexia.

The same author says further on: "Whether from a clinical point of view or a pathological one these two diseases (myxœdematous idiocy and congenital myxœdema) ought to be united, the one resembling myxœdematous troubles in the formed subject—myxœdema of the adult; the other representing the same symptoms in the as-yet-undeveloped organism of the child—congenital or infantile myxœdema." In this statement we fully concur.

He does not draw any real distinction between cretinism and myxœdema, but divides cretins, in respect to their intelligence, into the following three orders, beginning with the lowest order—the pure idiot:—

1. Cretins. 2. Micretins. 3. Cretinoid state.

1. The cretin proper is *l'homme-plante* (Roesch); his sense of smell and taste is but little developed, and the sense of touch is much diminished; such cretins are apt to die young of epilepsy or cardiac weakness, but may live to be 70 or 80 years old. They lead a purely vegetative life.

2. Micretins are on the intellectual level of a chimpanzee, because the animal can do all that a micretin can. He is "*l'homme-animal*." (Roesch.)

3. The cretinoid state is simply characterized by a retardation of intelligence, by a certain difficulty in comprehension, by a heaviness of mind; it corresponds to the abortive type of atrophic myxœdema.

Such classification may be helpful up to a certain point, but the classes cannot be kept rigidly distinct, the border-line between either two being invisible. WILLIAM OSLER.]

As in any other disease three orders may be recognized: (1) the very severe, (2) the less severe, and (3) the aborted, so to speak; they should not be separated, but shall all be classed under one main head and recognized as belonging to one entity. In no one case of cretinism shall we find all the possible symptoms present, and no two cases will exactly resemble one another; but from the symptoms present we can say whether the case is a severe one or not.

[If the two classifications are carefully studied it will be seen that there is no essential difference between them; a patient with congenital myxœdema is a cretin; the micretin is described by the condition of precocious infantile myxœdema, and the cretinoid state is that of abortive, or "*fruste*," myxœdema. WILLIAM OSLER.]

Differential Diagnosis. — Cretinism must be distinguished from achondroplasia: *i.e.*, foetal or congenital rickets, idiocy, and infantilism or dwarfism; also lipomatosis universalis, and hydræmic anæmia.

[Koplik (N. Y. Med. Jour., vol. lxvi, No. 10), following the lead of Horsley and Barlow, believes that "sporadic cretinism or infantile or congenital myxœdema should now also include those congenital cases formerly reported as congenital rickets." WILLIAM OSLER and RUPERT NORTON.]

ACHONDROPLASIA, CHONDRODYSTROPHIA FETALIS, OR FETAL RICKETS, presents certain similarities to cretinism (Osler, *Trans. Congress Amer. Phys. and Surgs.*, vol. iv, p. 190, '97). Although children suffering from this condition are dwarfs, yet they do not show any myxœdematous change of the skin; the long bones are very short, but the articulations are enormous, due to an hypertrophy of the cartilaginous ends of the bones. Mentally the patients are not degenerate.

RICKETS.—From ordinary rickets there can be little or no difficulty in distinguishing cretinism; in the former we find no thickening of the skin, which is moist, not dry as in infantile myxœdema. We also have the beading of the ribs, the enlarged epiphyses, and the prominent bosses on the skull, none of which are seen in cretinism. But it is the condition of the skin and facial aspect which make cretinism absolutely characteristic.

IDIOCY.—Children suffering from idiocy, when not due to disturbance of the thyroid function, do not suffer, as a rule, from retardation of physical growth. Their heads are apt to be smaller, much smaller than those of cretins, except in cases of hydrocephaly, and the fontanelles and sutures have usually closed prematurely. Here, again, the lack of any alteration in the skin would be almost enough to distinguish the two diseases at first sight. But from the type known as the Mongol idiot the marks of distinction are not so readily recognized.

[The Mongol type of idiot resembles the cretin more closely than any other. Telford Smith, in speaking of this form, says: "Idiots belonging to the so-called Mongol type are those who most nearly resemble the cretin, both in physical aspect and in mental character. In idiots of this type we get the stunted

growth, the dull, heavy expression, with open mouth and thick lips; the slow, deliberate movement, and hoarse, guttural, and monosyllabic speech; the mental apathy, and lack of spontaneity; the sluggish circulation, and sensitiveness to cold. A thickened condition of subcutaneous tissue is often found, with dull cutaneous sensibility. The skin is coarse and dry, the hair short and thin. First and second dentition are delayed. As far as palpation enables one to judge, the thyroid gland is subnormal in size. Pseudolipomata I have not found." He has tried the effect of thyroid extract with some benefit, but there is not the same remarkable change as in the cretins. I cannot altogether concur with Dr. Telford Smith's statement as to the slow, deliberate movements and mental apathy of Mongolian idiots. It was a form in which Dr. Kerlin, of Elwyn, was particularly interested, and with him I had many opportunities of seeing cases. They rather impressed me as vivacious, often very sprightly and mischievous. In no instance was there any condition of the subcutaneous tissues suggestive of myxœdema. WILLIAM OSLER.]

To distinguish infantilism from cretinism is in many instances extremely difficult, and there is much confusion in the papers on this subject.

Literature of '96-'97-'98.

[Brissaud (*Nouvelle Icon. de la Salpêtrière*, Anno x, No. 4, pp. 240-262) believes that infantilism is nothing more nor less than myxœdematous idiocy, and that the differences in degree of infantilism result from two conditions diversely associated: (1) the intensity of the atrophic thyroid lesion; (2) the age at which the suppression of the thyroid function produced arrest of development. He says "many cases of infantilism should better be called cases of 'anangioplasia'; they have nothing to do with disturbances of the thyroid. Such are the cases first described by Lorain; they are not cases of arrest of development, but rather arrest of growth as a partial result of premature epiphyseal ossifica-

tion; there is nothing infantile about them, except the figure; these are cases of small adults." Or in other words infantilism is a "morphological syndrome characterized by the preservation in the adult of the exterior form of infancy with the non-appearance of the secondary sexual characters" (Osler, *Trans. Congress Amer. Phys. and Surgs.*, vol. iv, '97). There are many cases reported (Wunderlich, *Brit. Med. Jour.*, ii, 1420, '97; Dukes, *Brit. Med. Jour.*, i, 618, '98; and others) where the symptoms of cretinism or myxœdema are almost altogether lacking, and where the evidences of infantilism exist, but which improve markedly under thyroid treatment, thus showing that they should be classed as cases of cretinism, and not infantilism. It is such cases as these which have led to the confusion on the subject; but in future the differential diagnosis will be made readily if in no other way than by the effects of thyroid treatment; for undoubtedly a condition of infantilism does exist, non-dependent on the condition of the thyroid gland. WILLIAM OSLER.]

Lipomatosis universalis is a form of partial idiocy, with enormous fat accumulation; growth is not stunted, and the condition of the skin is quite different from that of cretinism.

In *hydræmic anæmia* there is a swelled condition of the eyelids, face, and lips; sometimes of the extremities; but rarely of other parts of the body. The temperature is normal; the bony system is perfect; there is no macroglossia, no alteration in hair or skin, no obliteration of bridge or nose; no mental defect. Koplik (*N. Y. Med. Jour.*, vol. lxvi, No. 10).

Etiology.—All forms of cretinism depend on absence or atrophy of the thyroid gland, or upon some disturbances of its function. But we are as yet in ignorance as to those causes which produce atrophy, or as to what the exact functions of the gland are. Non-existence of the gland as a congenital affection has been demonstrated in a few cases of cretinism. Sporadic cretinism may occur, as far as we yet know, in any land; cases

have been reported all over Europe and in this country.

Literature of '96-'97-'98.

Clinical summary of 60 cases observed in the United States by various authors:—

Sex: Males, 24; females, 36.

Age: Under two years, 6; from two to five years, 12; five to ten years, 12; ten to fifteen years, 10; fifteen to twenty years, 7; twenty to thirty, 3; thirty to forty, 4; over forty years, 4.

Nationality: American, white, 12; colored, 1; Polish, 2; French, 1; German, 5; Swede, 1; Hebrew, 1; Norwegian, 1; Irish, 7; English, 1; Swiss, 2; Bohemian, 1; nationality not given, 23.

Locality: There is no region in the country in which the disease is endemic, nor does it appear to be more prevalent in those districts, as in Michigan and parts of Ontario, where goitre is common.

Condition of the thyroid gland: Goitre was present in 7; gland stated to be normal in 12; gland small in 2; gland not to be felt in 16; no note in 20. William Osler (*Amer. Jour. Med. Sci.*, Oct., '97).

The endemic form probably occurs only in mountainous regions, and usually in the valleys between the mountains; it is endemic in parts of Switzerland, Italy, France, India, South America, Central America, and Mexico. In the United States and Canada this form is unknown, and it is never seen in low-lying countries or on the sea-coast. Goitre is prevalent where endemic cretinism occurs, and the two affections bear a definite, though unknown, relation to each other. Baillarger says: "Endemic cretinism never exists without endemic goitre." In localities where goitre among human beings exists, it is also found to be prevalent among animals, especially among mules, but also among dogs and goats.

Literature of '96-'97-'98.

[The idea has long existed that the drinking-water in these mountainous regions was the cause of both goitre and endemic cretinism, and that they were due to either chemical or physical properties of the water, but Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) thinks that experiments have proved that the maladies cannot be attributed to either of these properties, but that the cause is a living micro-organism. He says that "goitre, and consequently cretinism, is an infectious disease, caused by a microbe, and that the microbe produces an hypertrophy of the thyroid, as others produce an hypertrophy of the spleen, kidneys, etc." He thinks that it is not always due to the drinking-water, but that the microbe may be "air-borne." Virchow also thinks air a possible means of infection. He and Rabuteau believe that goitre is the result of the feeble action of a noxious principle, and cretinism that of a strong and prolonged action.

Bouchardat and Bircher think that goitre is the first stage of cretinism. Air-infection might account for the epidemic which occurred in Somersetshire, England, in 1847; no cases are to be found there now. Combe gives an interesting account of an epidemic of goitre which occurred in Lausanne: and his study of these cases leads him to believe that not only is air an important factor in the causation of the disease, but that the affection is also contagious.

Mendel (*Deutsche med. Woch.*, p. 101, '95) suggests that the function of the thyroid is to secrete a substance which, when present, prevents the formation of or neutralizes, if formed, certain toxic substances. If the thyroid material be wanting, these hypothetical toxins accumulate and excite the symptoms already named.

Paterson (*Lancet*, ii, 849, '97) expresses his views in the following manner: "The first theory is that the gland secretes some substance which is essential to the healthy and harmonious working of the central and peripheral nervous systems. By the want of this substance the nervous mechanism is deprived of a some-

thing which regulates the formation and deposition of mucin products, so essential a feature of both diseases (sporadic cretinism and myxœdema), the mucin being thus deposited in the superficial and finer meshes of the corium, impairing motility and impeding nervous influences, afferent as well as efferent. The second theory is that the thyroid gland excretes from the blood some materials formed in the body-metabolism, which by their retention cause a form of toxæmia, affecting principally the cerebral centres and the nervous mechanism concerned in mucin metabolism." Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) sets forth a new view. He says: "Not alone the material antitoxins, but also the toxins, pass through the placenta. The child, as a result, would run a risk of being continually intoxicated, not only by its own toxins, but by those of its mother, if he did not possess a powerful antitoxic gland. What is the object of the thymus if not to accomplish this important task? The thymus is a powerful antitoxic gland, and a gland antitoxic for albuminoid toxins, like the thyroid, since cases of myxœdema have been treated and cured with the thymus given in sandwich. Now, the cretin, whether he has a goitre or an atrophied thyroid, is born with a non-atrophic thymus. It is thus the active principle of the thymus which supplies the absent thyroid antitoxin, but as the thymus atrophies, as its active principle diminishes, poisoning manifests itself, and as a consequence cretinism develops. If the child is born a cretin it is probable that atrophy attacked the thymus as well as the thyroid: a fact which it is necessary to verify. This hypothesis is all the more probable, as Marie observed a case of congenital myxœdema in which the thymus was hypertrophied." From this he concludes that "the thyroid is an antitoxic gland whose function is to destroy, or modify, either by rendering innocuous or useful, some toxic substances resulting from the digestion of certain albuminoid bodies."

Monssu (*Comptes-Rendus Hebdom. des Séances de la Soc. de Biologie*, 2, S.,

vol. iv, No. 2, '97) and Brissaud (La Presse Méd., vol. i, No. 1, '98), on the other hand, do not believe that all the conditions seen in cretinism are due to the thyroid alone, but are also largely dependent on the parathyroid glands. Moussu draws deductions from experimental evidences, which, he believes, prove that the two glands have two distinct functions—the suppression of the thyroid causing only chronic disturbances, that of the parathyroid provoking acute accidents; that death almost always follows extirpation of the latter, while disease alone is the result of extirpation of the thyroid. The parathyroids hypertrophy after removal of the thyroid. Brissaud from clinical evidence alone draws similar inference with regard to the difference of function of the two glands. He says “without doubt neither the structure nor the functions are the same, but it appears evident that very early in life they may replace each other (*qu'elles se confondent à l'origine*)”; and if, at a given moment, they are specialized so as to fill two absolutely-different rôles, and possibly antagonistic ones, the simplest may, in a measure, take the place of the more complex and highly developed; in short, to take up both rôles, should it so happen. The human thyroid gland, if this is the case, would represent a perfected parathyroid with delicate epithelium (*“perfectionnée à épithélium fragile”*), but still preserving among its new elements the old parathyroid epithelium, more worn (*“fruste”*), more resistant, and more durable. . . . In any case, however, it seems to me incontestable that the thyroid myxœdema, to speak accurately, is that form which is not complicated by intellectual apathy, and that parathyroid myxœdema is that form which, resulting from a total alteration of the glandular structure, expresses itself not only by the characteristic infiltration, but by the arrest of development in the cretinoid idiot, or by the brutishness of cachexia strumipriva.”

Magnus Levy (Verhandlungen des Congresses f. innere Med., Wiesbaden, '97) believes that cretinism in all its various forms depends on a perverted

function of the thyroid, whether that be an increased or a lessened one. In four cases which he studied he found a diminution in the consumption of oxygen and formation of carbon dioxide, whereas in Graves's disease it has been more than once proved that there is a marked increase in the consumption of oxygen and the formation of carbon dioxide.

Bircher (Trans. Congress Amer. Phys. and Surgs., vol. iv, p. 203, '97) stands alone with his theory of the non-dependence of cretinism on the thyroid gland, but the accumulating evidence is so strongly opposed to such an idea that his proposition demands more confirmatory evidence than he has brought forward to substantiate it.

Such are a few of the theories which have been suggested to explain the conditions found in cretinism, but, except for the microbic theory of Combe, they do not explain the ultimate cause of the atrophy or degeneration of the gland. [WILLIAM OSLER and RUPERT NORTON.]

In this disease as in all obscure ones we find numerous causes given as possible factors, but none of them seem to play an important part; alcohol, syphilis, and tuberculosis have been considered in this relation, but no definite connection can be traced between them and cretinism. It has been suggested that cretinism may follow “alcoholic conceptions.” Various nervous diseases in the families of both father and mother, or in the parents themselves, have been looked to as producing the cretinoid state, but no proof can be shown to confirm this theory. Cretinism may, however, follow as a very rare result some of the infectious fevers; for example, typhoid, scarlet fever, pneumonia, and whooping-cough; also an injury. Myxœdema in adults has followed erysipelas and acute rheumatism. Women who have once given birth to a cretin are likely to give birth to more if they become pregnant, but this may be prevented in some instances by placing the mother under thy-

roid treatment during her pregnancy. And, again, women who have lived in healthy countries and given birth to healthy children may give birth to cretins if they remove to a place where cretinism is endemic; but may, again, give birth to healthy children, if they return to a healthy locality.

[It has been suggested that as cretinism is more common in the female sex than in the male, that the thyroidal congestions caused by menstruation, pregnancy, and lactation may play a part in bringing about degenerative alterations of the gland. Cretinism does occur among the negroes of the United States, but is rare. "In cretins 25 per cent. have no thyroid gland, or it is replaced by connective tissue; in the remaining 75 per cent. the function is suppressed as a result of degeneracy of the gland, and in these cases, according to Kocher, there is oftenest a colloid goitre" (Combe, *Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6). Goitre is more common in females than in males, and cretinism, with or without goitre, is more common in females. Griesinger has pointed out that, where cretinism is endemic, besides cretins, micretins, and the goitrous, one finds also a quantity of imbeciles, deaf-mutes, stutterers, dwarfs, and degenerates. The French Commission came to the conclusion that goitrous parents engender cretins in a much larger proportion comparatively than non-goitrous parents. WILLIAM OSLER and RUPERT NORTON.]

Literature of '96-'97-'98.

Sound and strong parents who have lived far from regions in which cretinism is endemic and had there begotten normal children, after moving into a district of cretinism have begotten one or more cretins. In some of these cases the parents, either father, mother, or both, became victims of goitre, but without a trace of cretinism. Moreover, after such parents have returned to their former place of residence, they again begot healthy children. In some cases normal children were begotten in the

cretin districts by parents to whom cretins were also born.

The same influences which lead to goitre are a cause of cretinism. Whenever goitre or cretinism appears in children, one or the other of the parents will be found to have goitre. The discomforts caused by goitre, no matter how intense they may be, never lead directly to cretinism, not even in the slightest degree, but cretinism arises only and solely, when, by degeneration of the thyroid gland through goitre, or equally well by means of some other injury of the gland, its function is destroyed or seriously impaired. Inherited and, at the same time, congenital cretinism is derived from the mother alone; while inherited cretinism, which appears only after a lapse of months, or years, is derived from the father alone. Inherited and congenital cretinism is an exception.

The so-called inherited cretinism, as a rule, is congenital; that is, acquired during foetal life. The injury of the thyroid gland and the pathologico-anatomical substratum are the same as in cretinism, which develops later. But the injurious material is absorbed by the mother from without, and by her is transferred to the thyroid gland of the foetus. The overruling factor, then, is always the influence of the land upon which the mother lives. So long as the child is in embryo, its tissues, the provision and nourishment, as well as the disposal of waste-products, are cared for through the maternal blood. If, therefore, the thyroid gland of the child does not develop, or becomes atrophied through disease, the gland of the mother acts perfectly, both for herself and the child; so that the body of the child, at the moment of birth, will not show any more cretinic degeneration than that of the mother herself. If the latter have only a goitre in a thyroid gland in a normal portion of which the functions are still satisfactory, the child, at birth, will be plump and well-shaped. It is only when the child, independently of the mother, begins to nourish its own nervous system and with it the thyroid gland, that, as in acquired cretinism, the disturbance begins gradually to appear.

Kocher (Paris Correspondent Boston Med. and Surg. Jour., June 24, '97).

There is still one point to be considered with regard to the etiology of this disease, and that is the part played by "iodothylin," or "thyro-iodine," as it was first known. In 1895 Baumann (Hoppe-Seyler, Zeitschrift f. physiol. Chemie, '95) demonstrated the existence of free iodine in the normal thyroid gland. It exists there in very minute amount, and there is less in the glands of children than in adults, and less in diseased glands (goitres) than in healthy ones. He later extracted the body "iodothylin," which he believes to be the active principle of the gland; but it is doubtful whether this is the pure active principle; and, even were the cretinoid condition due to lack of formation of iodothylin in the human body, we would still be in ignorance as to the primary cause of disease of the gland. Therapeutic use of iodothylin has shown that both cases of myxœdema and parenchymatous goitres do improve under its administration; and that in sufficient doses it will prevent the development of the well-known symptoms, which occur in dogs, from which the thyroid gland has been experimentally removed.

Pathology.—Whether all the pathological findings in sporadic and endemic cretinism are identical is a question still *sub judice*, but the later studies seem to show that there is no essential difference between them, and that the earlier-drawn distinctions are not sufficient to separate them. Virchow was the first to state that the brachycephalic skull was typical of the endemic cretin, and was due to a premature synthesis of the os basilare, and the sphenoid, posticus, and anticus. This produces flattening of the bones at the root of the nose, and gives the peculiar expression to the cretin.

His deductions were drawn from a single case, and it has since been shown that the brachycephalic type of head is not characteristic, but that the skull may be flattened, round, or pointed (platy-, tropho-, or oxy- cephalic). It thus appears that no type of skull is typical of cretinism.

Another distinction has been made between endemic and sporadic cretinism, and that is that in the former the fontanelles close early, in the latter may remain open for a long time; but the significance of this difference is not yet appreciated or understood. The most interesting abnormal conditions seen in this disease pertain to the thyroid gland, the long bones, and the skin.

Literature of '96-'97-'98.

[The changes occurring in the thyroid have been most carefully and thoroughly studied by de Coulon (Virchow's Archiv, '97) and Barker (Trans. Congress Amer. Phys. and Surgs., vol. iv, pp. 196-199, '97), and their findings correspond in all essentials. The alterations found may be summarized as follows: "That, in addition to the evidence afforded by the size of the gland and the marked increase of connective tissue in it, the cellular and nuclear changes are atrophic and degenerative in nature, there can be but little doubt. The nuclear changes especially are those which are now generally recognized as characteristic of degenerative processes. They correspond in many respects to some of the lesions described by Oertel in human diphtheria, and by Flexner in experimental poisoning of animals with diphtheria toxins. Schmaus and Albrecht believe such nuclear appearances to be evidences of degeneration" (Osler, Trans. Congress Amer. Phys. and Surgs., vol. iv, p. 190, '97).]

It appears that goitrous manifestations are far commoner in endemic than in sporadic cretinism, but goitre has been noted in several instances of the latter

type of disease, and in all probability the presence or absence of goitre cannot be considered as a radical difference in the two affections.

Cretinism has a decided relation to goitre in this sense,—that the same factors that produce goitre produce cretinism. Cretinism may be present, however, in persons who not only have no goitre, but in whom all traces of a thyroid gland are absent. It appears, then, that cretinism bears a close relation to the abolition of function of the thyroid gland. The causes of endemic cretinism must be the same as those of endemic goitre. It is probable that this is infectious in nature and dependent upon some factor contained in the drinking-water. Theodore Kocher (*Deut. Zeit. f. Chir.*, B. 34, '92).

Literature of '96-'97-'98.

[Hofmeister (*Fortschritte auf dem Gebiete der Roentgen-strahlen*, B. 1, H. 1, '97), studying a case of cretinism with the Roentgen rays, shows that the alterations in the long bones in this condition are identical with those alterations produced in animals where the thyroid has been removed; such changes have been noted by him in guinea-pigs, and by Eiselsberg's experimenting with sheep, goats, and pigs. They both found that, if the thyroid be removed early, the bones grow slowly in length, and the epiphysal plates remain present for a long while. Hofmeister calls the resulting condition, after Kaufmann, "chondrodystrophia thyreopriva." In this condition the epiphyses remain cartilaginous long beyond the normal term. The rays show that, although the bones are otherwise normal in form, they are very small, and what appears most evident is lack of bony ends. In all the long bones only the diaphysis is to be seen—the epiphysis is either not present or there are only a few small nuclei of bone to be made out. The patellæ, although they could be felt, were not seen with the rays. In concluding his paper he states that "between sporadic and endemic cretinism no absolute dif-

ferences exist which in an individual case make a differential diagnosis possible."

Dolega (*Verhandlungen des Congresses f. innere Med.*, Wiesbaden, '97) speaks of the autopsy of a cretin, aged 28 years, whose skeleton throughout showed the embryonal cartilaginous epiphysis and synchondrosis. Microscopical examination of the bones showed conditions which resembled foetal rickets, but did not appear identical.

Langhans (*Virchow's Archiv*, B. 149, H. 1, '97) in an interesting paper, says: "Up to the present time no premature ossification of cartilage has been demonstrated in any cretin. The bones first represented by cartilage grow very slowly in length, and the epiphyses remain flat, ossification proceeds very slowly, the centres of ossification in the epiphysis appear very late, and the epiphysal plates remain a long time over the normal period. Remains of these even up to 45 years of age may still be demonstrated. . . . Periosteal growth is not markedly disturbed. . . . An abnormal thickness of the bones, such as Klebs describes, I have not been able to confirm. WILLIAM OSLER.]

In cretinism all autopsies agree in certain changes occurring in the histological development of bone quite distinct from changes occurring in rachitis, syphilis, or osteomalacia. In the long bones the typical and almost geometrical arrangement of the rows of cells, always found where hyaline cartilage is ossifying, becomes completely disordered. The rows of cells become irregular, the capsules swell up, and many of the cartilage-cells within shrink or disappear. The ground-substance itself may become liquefied in places, and all ossification which arises normally in such cartilage is checked, and growth in a longitudinal direction stops. The most marked change is at the junction of the epiphyses and shaft. In some of the autopsies fibrous connective tissue seems to appear around the epiphyses, forming soft, white deposits. Ossification of bone from membrane, and especially from the periosteum, is exaggerated, and the bones may become abnormally thick. William

B. Noyes (N. Y. Med. Jour., Mar. 14, '96).

As a result of the above-mentioned facts it is now shown to be impossible to separate cretinism from operative cachexia thyreopriva, as Bircher has done. Therefore we may conclude from our present knowledge that they are identical and that the former is, as Kocher first sharply and clearly stated, very probably caused by a lessened function of the thyroid during the foetal period as a result of toxic influences, either by becoming atrophic or entirely degenerating, or possibly by the formation of non-functioning struma-islets ("*Strumaknoten*") and the remaining portions of the gland being caused to disappear by pressure. . . . We should consider the development of the cretin in the following light: That cretins in foetal condition develop normally, that only after birth does the absence of the normal thyroid make itself felt, and that the first signs of cretinism appear at the fourth or fifth month after birth, and in the course of the next years of infancy make themselves more and more evident."

From the examination of three specimens of thyroid gland from adult cretins, nothing especially abnormal is found in gross appearances of texture. Microscopically, is noticed a deficiency of gland-tissue and excess of connective tissue, and adventitia of the arteries thickened. In one of the less altered glands there were small foci filled with leucocytes. The most perfect alveoli are small and have only a single layer of epithelium; the others show less and less epithelium, some showing none and being filled with leucocytes or colloid masses, or cellular *débris*. There was never wanting some gland-tissue capable of performing its function. This lends strong support to the theory of the dependence of cretinism upon disordered function of the thyroid. A. Hanan (Brit. Med. and Surg. Jour., Oct. 4, '90).

As regards the alterations occurring in the skin, there is no such general agreement. The important question of the deposition of mucin is undetermined; the number of cases investigated thus far has been insufficient to settle this point, as the findings have differed.

Literature of '96-'97-'98.

[Virchow does not consider mucin as a constant and specific product of skin which has undergone myxœdematous changes; and Unna found no mucin in two cases studied by him. A number of studies of the skin in myxœdema have been reported, but as yet there are none on this tissue in cretinism. Since the two diseases seem to be now recognized as identical, we may accept the alterations found in myxœdema as characteristic also of cretinism.

Barclay Ness (Glasgow Med. Jour., Aug., '97) describes the condition of the skin in myxœdema, from the study of one case with autopsy, as follows: "The skin from the back of the hand was examined, and it was found that there was an abnormal proliferation of cells in the corium, especially along the courses of the capillary vessels. With regard to the sudoriparous glands, these were not atrophied, but their epithelium was much swelled, indicating a condition which might possibly have interfered with their function, and thus explained the dry condition of the skin."

Beck (Monat. f. prakt. Derm., B. 29, No. 12, June 15, '97), in reporting his findings in the skin in a case of myxœdema, reviews all the work done on this subject, and his paper is the most exhaustive one that has as yet been published. He draws the following conclusions: "Regressive and progressive changes both play a part alongside each other. The regressive changes were noted in the epidermis and the different tissue-elements of the cutis; the latter were limited to the collagen and the smooth muscle-fibres of the cutis. In the epidermis the regressive changes present themselves as a 'sterile' condition, a necrosis and a degeneration of the protoplasm of the epithelial cells;

in the cutis these changes are marked by a fibrillation of the collagen bundle and the formation of kollastin. The progressive changes consist of an increase in the collagenous tissue in the middle, and a multiplication of the smooth muscle-fibres in the middle and lower layers of the cutis. A special place must be reserved for the changes in the fat-tissue, which, as it appears, not only increases in amount, but also undergoes a chemical change of the fat-globules."

Langhans (Virchow's Archiv, B. 149, H. 1, '97) found marked fatty degeneration of the muscles; it was generally distributed throughout the body, and the fat-globules were everywhere small. He says this condition is very rare and differs from that found, for instance, where it attacks the heart; then the distribution is not so general, and there is variation in the size of the fat-globules. He contends that in cretins this may result from the low temperature and imperfect oxidation; but toxic influences and the anæmic condition may also play a part.

In reporting a case of cretinism with autopsy Friend (Med. News, Dec. 4, '97) states that study of the pituitary body, thymus gland, suprarenal capsules, as well as of other tissues throughout the body, merely showed an excess of fibroid growth in all; and that the marrow was red in all the bones.

Ness (Glasgow Med. Jour., Aug., '97) in his case, found extreme thickening of the capsule of the kidneys, with fibroid degeneration of the glomeruli; the latter appeared to have been primarily affected, and the capsule secondarily in places. (Although albuminuria and casts are found in the urine in a small number of cases, yet so far as we know there is no characteristic lesion of the kidneys in these cases, nor does the kidney seem in any manner to be seriously affected.) Red marrow in the bones (Friend) is unusual. "The marrow instead of being red is yellow (fat-marrow), which explains the anæmic condition of cretinoids. Only at the extreme ends of the bones near the cartilage is red marrow found" (Langhans). WILLIAM OSLER and RUPERT NORTON.]

There seems to be a general agreement among observers that the blood shows a condition of secondary anæmia; but there is considerable variation in the findings.

Blood studied in a case of congenital myxœdema treated with thyroid. The diameter of the red corpuscles before the treatment began was 3.13 microns; afterward it was 7.5 microns. At the same time the appearance of nucleated red corpuscles was observed, which disappeared under treatment. It would appear as though the persistence of the foetal state of the blood coincided with the tardy development of the body. Lebreton and Vaquez (La France Méd. et Paris Méd., Jan. 18, '95).

Literature of '96-'97-'98.

[Koplik (N. Y. Med. Jour., vol. lxvi, No. 10) says: "It is an interesting fact that in this case, early in the disease, the hæmoglobin was greater than later on, though the infant was immediately placed upon thyroids." This would seem to point to the fact that the anæmia of cretinism develops as the disease progresses, and is not present at the initial stage of the disease.

Vaquez (Le Progrès Méd., Mar. 20, '97) found "merely a condition of anæmia, with presence of nucleated red cells; there appeared to be augmentation of the globular diameter" (first noted by Kroepelin); he did not find any leucocytosis, but there was an increase of the large mononuclears relatively to the number of polynuclears, after treatment with thyroid.

Pollaci (La Reforma Med., vol. ix, Oct., '97), who has studied the blood in cretinism more carefully than any other observer, draws the following conclusions: 1. The blood of these two myxœdematous cretins presented the physio-histological characteristics of a common simple secondary anæmia; in different degree a single characteristic distinguished this oligæmic condition from similar conditions of oligæmia met with in other diseases—that was the presence of megalocytes. 2. Digestive leucocytosis had no special character-

istics which distinguished it from alimentary leucocytosis studied in other diseases.

Foerster (*Deut. med. Woch.*, Nos. 12, 13, 16, '97) does not mention the presence of megalocytes, but says that "there is generally a slight diminution of the reds, with deficiency of hæmoglobin; as regards the whites they may or may not be increased, probably generally not. With reference to the different forms of white cells, there are not sufficient studies to express any definite opinion, as the findings have varied." WILLIAM OSLER and RUPERT NORTON.]

On other pathological conditions existing in cretinism not enough is known to report definitely, but a few of them may be mentioned. Curvature of the spine occurs in some cases, though not in any large percentage. Some observers have noted hypertrophy of the pituitary body after thyroidectomy on animals; but nothing can be stated as to the meaning or importance of this fact. Excess of cement in the heart, which was first described by Ord, was not found by Ness (*Glasgow Med. Jour.*, Aug., '97) in his case.

Literature of '96-'97-'98.

[Langhans (*Virchow's Archiv*, B. 149, H. 1, '97) found exactly the same condition of the ovaries as Hofmeister did in his experiments with guinea-pigs: *i.e.*, a marked degeneration as shown by the presence of numerous small cysts. The testicles, according to this author, were neither macro- nor micro- scopically normal; they were small and contained but few spermatozoa. Maffeo, Niepee, and Stahl have described this same atrophic condition of the testicles. The "muscle-spindles" have been most exhaustively studied by Langhans (*Virchow's Archiv*, B. 149, H. 1, '97), but, as he says, they have been previously so little studied that the changes he found in them in cretins cannot be definitely stated to be characteristic: yet the alterations in them from the normal were so marked that he believes they are one of the stigmata of this dis-

ease; the changes seem to consist of an exfoliation of the lamellæ of the spindle, with a deposition of mucinoid granules in the spindles, and an increase of connective tissue running through them. WILLIAM OSLER and RUPERT NORTON.]

Of other pathological conditions found in cretinism we know little or nothing.

Prognosis.—This has entirely changed since the introduction of the thyroid treatment; previous to this discovery little could be done to improve the cretinoid condition. To-day the outlook for cretins, more especially the sporadic cases, is bright; as regards the endemic cretins we cannot entertain such a hopeful view, though the chances of their improvement are much greater than they were. Cretinism is never of itself a fatal disease.

Treatment.—The use of the thyroid gland in one form or another has revolutionized the treatment of cretinism. Before this discovery we could do but little to improve the condition of patients suffering from this disease; pilocarpine seemed to be of some service through its action as a sudorific, and a mild winter climate also helped in slight degree to keep the patients from going down hill as fast as they otherwise might.

In the thyroid gland there seems to have been found a specific, and no other remedy appears necessary with which to treat the disease. The remedy, though a specific, is not all-powerful, since the permanency of its action depends on its constant use. Even with its use we cannot promise a cure in any given case, for unless treatment be continued indefinitely a relapse will surely occur. The treatment seems to be of more avail in sporadic than in endemic cretinism; but this is not an established fact, and it seems probable that if treatment is begun as early as possible in cases of

endemic cretinism we may hope for the same good results as are seen in children with sporadic cretinism. But to attain this mothers with goitre or those who have given birth to cretins or other degenerates should take the thyroid treatment during pregnancy. One satisfactory result of treatment is "that one thing appears to be proved by our observations, which corresponds to the findings of other observers, and which is not only theoretically interesting and practically important, but also consoling for the patient, and that is that under no conditions will the disease (which has been treated with thyroid, and then treatment stopped) develop again in its primary intensity." (Foerster, *Deut. med. Woch.*, Nos. 12, 13, and 16, '97.)

The later in life the condition of cretinism develops, the greater is the probability of almost perfect mental recovery under treatment, since mental degeneracy is never so prominent in adults as in children; the adult does not become an idiot as the child does from cretinism; whereas if the condition has developed early in life and been left untreated, the chance of normal mental development is seriously diminished. In both instances the return to a normal physical state is almost certain, as the body-symptoms react sooner to treatment, and they are the first to recur if treatment is interrupted.

The increase in height and the improvement in the condition of the skin under thyroid treatment are the two features which make the prognosis so favorable. Children show a most astonishing rapidity of growth during the first months or a year of treatment—a gain of eight inches in a year has been seen, and in a number of cases the increase was an inch or more a month for several consecutive months. After hav-

ing thus attained a nearly normal stature, growth proceeds gradually, as in healthy children.

Literature of '96-'97-'98.

Case of a child who presented a typically cretinoid appearance when first seen in February, 1896, then 5 years old. Mentally deficient. Given one 5-grain tabloid of thyroid extract (Burroughs, Wellcome & Co.) daily, which raised the temperature to 102° F.; dose reduced to one-half. Gradual improvement. Weight fell at first to twenty pounds, and then slowly increased, the cretinoid aspect disappeared, and the intelligence steadily improved. Continued to take smaller quantities of the extract, and has developed into a healthy child, weighing thirty-seven pounds, and measuring thirty-seven and one-half inches in height. No thyroid gland could be detected on palpation. W. Carr (*Brit. Med. Jour.*, Nov. 13, '97).

Probably cretins never develop physically so as to become the equals of normal children of their own age, but they are no longer dwarfs. This development of stature is the single permanent gain of treatment, since there is relapse of all the other features of cretinism if treatment is not persisted in. The change of the myxœdematous state of the skin is as remarkable as that of growth; the wrinkles disappear, also the œdema, and from being harsh, dry, and scaly, it becomes soft, moist, and smooth. The hair also shows great improvement, it grows normally where it had been lacking before, and becomes fine and thick, supplanting the coarse, thin hair characteristic of cretinism.

It is the brain, however, which, as the more delicate organ, suffers most in this condition; it responds more slowly than the body to the effects of treatment, and seldom if ever recovers a normal tone. Children who have suffered from cretinism are not so intelligent, as a rule,

as other healthy children. As Koplik (*N. Y. Med. Jour.*, vol. lxxvi, No. 10) says: "Though the thyroid treatment rescues these unfortunates from a state of perpetual idiocy, it does not restore fully the psychical state, which has become dwarfed for a greater or less period before the therapy was initiated. Though bright, the children are not the equals of children of normal condition of their own age, but are very slow in appropriating ideas and in perfecting their speech-vocabulary." However, there are exceptions to this rule, and where the degree of cretinism is not marked, where the body seems to be more affected than the brain, children may be quite as intelligent and bright as those unaffected. There are a few cases reported where, though the physical symptoms were very much ameliorated, yet there was almost no improvement in the mental condition.

[Such cases have been reported by d'Andrea and Pieraccini. It is probable that in such instances there is a bad neurotic family history, or that the children themselves, before the onset of cretinism, have suffered from some neurosis (for example, convulsions, epilepsy, etc.). WILLIAM OSLER and RUPERT NORTON.]

Effect of thyroid treatment is: Increased metabolism, shown by (1) elevation of temperature; (2) increased appetite, with more complete absorption of nitrogenous foods; (3) loss of weight, with nitrogen excreted in excess of that taken in the food; (4) growth of skeleton in the very young; (5) marked improvements in body-nutrition generally; (6) increased activity of mucous membranes, skin, and kidneys. The rheumatic symptoms and the anæmia are not only not relieved, but are most frequently aggravated. G. N. Crary (*St. Louis Med. and Surg. Jour.*, July, '95).

Literature of '96-'97-'98.

[Increase of anæmia and aggravation of rheumatic symptoms observed in case of goitre complicated with rheumatism

in which thyroid tablets were given. The tablets were discontinued and salicylates and iron substituted with good effect. C. S. WITHERSTINE, Assoc. Ed. *Annual*, '96.]

Without treatment cretins may live to an advanced old age, even to 70 or 80 years, though death is more common between the second and third decade or before 35. They are liable to very slight ailments, and usually die of some intercurrent affection, since cretinism seldom of itself causes death. We know of no difference as regards prognosis whether the child has a goitre, or shows atrophy or absence of the thyroid gland. In some cases even the goitre itself may be cured. Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) says: "Goitres may be cured by thyroid treatment; the younger the patient, the more efficacious is the treatment. Cystic goitres are not amenable, nor old colloid ones where there is much new growth of connective tissue, with a colloid degeneration of the vascular walls and interstitial tissue."

The remedy is a powerful one, and, where used carelessly, a dangerous one; patients have been killed by injudicious use of the thyroid gland.

Literature of '96-'97-'98.

[Anders (*Jour. Amer. Med. Assoc.*, July 10, '97) says: "There can be no question that the evidences of cardiac disturbance constitute a really serious defect, and perhaps the only one in the thyroid treatment." He goes on to say, however, that "the relation of mere albuminuria or actual nephritis to myxœdema is not definitely known. On the other hand, it should be pointed out that the symptoms of Bright's disease have been observed to appear after the accomplishment of a cure by thyroid feeding, in cases which no urinary phenomena had been present during the course of myxœdema." This is certainly a very

rare occurrence and not one to be considered in the use of the drug.

Telford Smith (*Lancet*, vol. ii, 853, '97) has lately drawn attention to one of the disturbances resulting from this treatment which should be watched for: "I have found that during thyroid treatment this rapid growth of the skeleton leads to a softened condition of the bones, resulting in a yielding and bending of those which have to bear weight; and as cretins under treatment become much more active and inclined to run about this tendency has to be guarded against. The bending takes place most markedly in the tibia and fibula, the increased size of the ends of these bones at the ankle and knee being very noticeable." WILLIAM OSLER and RUPERT NORTON.]

The use of thyroid extract is only permissible when the patient can be kept constantly under observation, because of the severe and sometimes dangerous symptoms which it produces. Zarubin (*Archiv f. Dermat. u. Syph.*, B. 37, H. 3, '96).

Case of cretinism in a girl, 14 years of age, in which the thyroid-gland treatment was instituted and followed by a very slow improvement mentally and a much more marked one physically. After undergoing the treatment at irregular periods during about nineteen months, her temperature suddenly rose to 104° F., her pulse to 160, and respiration became so short and thick that it was only with difficulty they could be counted. At this time she was taking 6 grains of thyroid extract daily. Medication was immediately stopped, but her condition remained the same, with one remission of temperature and pulse-rate, during two days, when, on January 22d, at 1 o'clock in the afternoon, she died. S. H. Friend (*Med. News*, Dec. 4, '97).

Caution must be exerted in the use of thyroid medication, for, while it is all powerful for good in suitable cases, it is not without ill effect in poorly-selected cases or in overdoses. It is best to begin with 5-grain doses daily and increase gradually to 15 grains daily in divided doses. A rise of temperature to one degree above normal, an increase of the

pulse-rate of more than twenty beats per minute, or any gastro-intestinal disturbance indicates that the dose is too large and must be reduced. F. A. Dodge (*Northwestern Lancet*, Oct. 15, '98).

Many methods have been suggested and tried for administering the thyroid gland, but the best and only practical one is by the mouth. The gland may be used raw or cooked, or prepared with glycerin as an extract, or in powder, tablet, or pill form. The surest and safest form is the tablet as prepared by one or other of the large wholesale drug firms (Parke, Davis & Co.; Frazer, Armour, and others). These tablets are not all of equal strength; so that in treating a case it is better to use but one make than to change from one to another. The dose varies from 1/2 grain once or twice a day in infants, up to 5 grains t. i. d. in adults, till all symptoms of cretinism have disappeared; the drug may then either be omitted entirely for from three to six weeks, when symptoms of cretinism almost always recur, and treatment must be resumed, or doses of 5 grains every week or ten days may be persistently taken, and thus all evidences of returning cretinism be avoided. It is, perhaps, better after the first period of treatment has been successfully carried out to omit all treatment till some of the old symptoms again appear, and then to note carefully just how much thyroid is required to extinguish these; in this manner it is easier to estimate just the dose required from time to time to stave away any sign of the disease.

In some instances the tablets seem to lose their effect, and it is then well to try those of another make for a time; the first will, if resorted to again later, oftentimes be found to have the same good effects as when first tried, but the organism seems to get dulled to them, and not

to respond so quickly after prolonged administration, just as is often seen in the use of digitalis in cardiac disease. The dosage must be regulated by the effects either advantageous or the reverse; where no bad symptoms are noted the drug may be pushed, but on the slightest evidence of any or some of the conditions to be immediately mentioned the drug should be stopped entirely for awhile, till all its bad constitutional effects have passed off.

The remedy may give rise to headache, syncope, and vertigo; to tachycardia, dyspnoea, suffusion of face and profound perspiration; to rise in temperature of two or more degrees (slight rise is a good sign, as the patient's temperature is almost invariably from one to two degrees subnormal); to nausea, vomiting, gastrointestinal pains and profuse diarrhoea; to rheumatic pains, tremor, and general weakness; to itching, urticaria, erythema, and eczema; to glycosuria or albuminuria. Many of these effects are doubtless due to contaminations of the active principle of the drug, but at present these noxious bodies cannot be sep-

arated, and therefore extreme care must be taken in the use of the drug. Most of the bad symptoms will pass off when the drug is stopped, and require no further treatment, but if the prostration that may occur is severe, suitable remedies to counteract this condition should be actively employed.

[Marie (*La Presse Méd.*, Oct. 9, '97) notes a curious symptom caused by thyroid treatment, namely: excessive thirst; the thirst was so great that the treatment had to be stopped; on the other hand, however, Briquet (*La Presse Méd.*, Oct. 9, '97) relates a case where treatment cured the excessive thirst which had existed previously. But such a symptom is anomalous whether before or after treatment, and therefore of but slight significance. WILLIAM OSLER and RUPERT NORTON.]

(See also THYROID EXTRACT in ANIMAL EXTRACTS, volume i.)


The treatment, as far as we can now see, must be continued on and off through life.

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